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The Mechanical Cause of the Morpeth Calamity.

MUCH light would be thrown on such occurrences as the Morpeth calamity if the scientific men who endeavour to elucidate the question would take the trouble of giving the positive mechanical data that bear on the case. It should be remembered that every railway casualty, rightly regarded, furnishes, or ought to furnish, a new experimental datum. We have been now engaged for fifty years in bringing to its present state of perfection a system of locomotion any anticipation of which, half a century ago, would have been regarded as the wildest dream. When George Stephenson said that it would be "verra aukard for the coo," if an engine running at the rate of twenty miles an hour were to come in contact with the animal, he only gave a quiet go-by to the ridicule with which the examining counsel was disposed to treat the prediction of the speed which might be attained by the locomotive. Mr. Stephenson was not so wild as his opponents implied, because about that time the speed of sixteen miles per hour was attained and kept up by a fast coach for several stages on the Shrewsbury road. Still the anticipation of being able to beat the best-horsed coaches by twenty-five per cent. was a bold one; and that the more so because the life had not at that time been breathed into the locomotive. It was not until after the great trial between the "Rocket" and the "Novelty," in 1829, that the blast was turned into the chimney of the former engine, and the true source of the velocity which it was possible to attain was thus accidentally discovered. Since that time the profession of the civil engineer has been engaged in a vast series of experiments with regard to steam locomotion. Every new line constructed and worked has added valuable data for the construction of a complete theory of locomotion. Financial, as well as mechanical statistics have been collected to a certain extent, more especially abroad, as the directors of the English railways have opposed, by every means in their power, the publication of any items of information that might throw light on the subject of the normal cost of each particular class of traffic. Among the sources of information which are most costly,—we speak now only as mechanics, and without reference to the incalculable cost of human suffering and death,—are those which are generally spoken of as "train accidents." Of these, in the six years 1870 to 1875 inclusive, there has occurred the number of 1,127. The money cost of these casualties it is not easy to estimate. The personal suffering they have involved may be inferred from the fact that they have occasioned 241 deaths, and injuries to 6,880 passengers, exclusive of any returns as to servants of the railway companies. The "train accidents" in 1875 were 164. If from each of these we fail to obtain some definite information, learn some new precaution, or avoid some latent cause of danger, we are guilty of a waste of the most costly sources of positive scientific knowledge. Our railway system will never be what it ought to be,—either financially or mechanically,—until the light of scientific truth is so thrown on every detail that ignorant maladministration shall be impossible.

Certain facts of cardinal importance with reference to the Morpeth calamity dropped from several witnesses in the course of the inquest, which no one attempted to connect, so as to show their great importance and their bearing on the object sought. That object, from an engineering point of view, was to ascertain the cause which led, in this particular instance, to the break-down of that important dynamical couple, of which the permanent way of the North-Eastern Railway formed one element and the Flying Scotchman train the other. The inquiry elucidated the fact that the fault, if any, which occurred in the moving element of this dynamical couple must be sought in the locomotive itself, and not in any of the various carriages composing the train. The consideration of these latter vehicles, therefore, may be eliminated from the problem before us. What we have to investigate, then, is the condition of the permanent way on the one hand and of the locomotive on the other.

Thus far we may be accused of only putting into formal (or non-mechanical persons may even say pedantic) language what everyone knows to be the case. There is, however, a distinct object to be attained by such definite statements. It shortens the road before us, and the point to which it directly leads is one which we think it would have been well for the professional men who gave evidence before the jury more distinctly to bring forward. That is, that it is necessary not only to know the exact condition of each element of the couple, but the proper construction of each element (supposing it to be in perfect order) for use at the velocity employed.

The facts as to this are the following:—First, the accident occurred on a curve; and it is well known that there is a mechanical tendency in a locomotive to run at a tangent to any curve over which it may be driven,—a tendency which increases in proportion, not to the velocity, but to the square of the velocity. Secondly, the curve was of the small radius of 17½ chains, or 1,155 ft., while the deviating force of the locomotive increases directly as the length of the radius of the curve diminishes, being as the square of the velocity divided by the radius of the curve. Thirdly, it is the custom of engineers to counteract to a certain extent the centrifugal or deviating force by raising the outer rail of a curve, so as to tilt the engine inwards, and thus to cause the force of gravitation to act, to a certain ascertainable extent, in counterpoise of the deviating force. This compensating force, however, is irrespective of velocity. The deviating force directly depends on velocity. It is in exact accordance with the mechanical principles involved in the problem that where a "cant" (or elevation of the outer rail) of 1½ in. is required for a speed of twenty miles an hour, the "cant" ought to be increased to 3 in. for a speed of thirty miles an hour. This was mentioned by Mr. Laws.

We have, then, these elements,—the weight of the engine, which Mr. Haswell, the assistant locomotive engineer, states at 47 tons 16 cwt.; and the radius of the curve, which Mr. Alfred Harrison, engineer of the northern division of the line, states at 17½ chains. The gradient does not so materially influence the case, as it is only 1 in 286, rising towards Newcastle. We have also the evidence of the inspector of permanent way at Morpeth, James Batley, that the "cant" at the spot where the engine left the rails was from 1¼ in. to 1½ in. This agrees with Mr. Laws's dimension of 1½ in. The great point as to which the evidence fails is as to the speed at which the engine was going when it left the line.

The conductor of the train says that it was from twenty to thirty miles an hour, but that he "only judged as best he could." It is plain that the train was late, and also that it was running at an extra rate of speed. It was twenty-four minutes late at Berwick, and only twenty-two or from twenty-two to twenty-three minutes late at Morpeth. "Perhaps two or three minutes," says the conductor, had been made up between Berwick and Newcastle.

It is thus evident that a high velocity was kept up over a portion of the line constructed, according to Mr. Laws, for a velocity not exceeding twenty miles per hour. "The ordinary rate of the train from Berwick, without shutting off steam, is from thirty to forty miles an hour," says the conductor, "perhaps a little more." On the occasion in question we see that the train was gaining on the ordinary speed. Thus we have reason to believe that Morpeth was reached at a speed of more than forty miles an hour—how much more is not apparent, although if the time-bills gave distance as well as times, this might be, at least approximately, ascertained. Steam was cut off on reaching Morpeth. But no whistle was sounded. No breaks—as far as the evidence goes—were applied. The only causes of retardation were thus the running friction and ordinary resistance of the train, and the slight check opposed by the rising gradient of 1 in 286. The retardation thus caused, unless the steam was cut off at a considerable distance before reaching Morpeth, must have been but

slight. But it is precisely here that the shoe pinches. There does not seem to have been any wish on the part of any witness to withhold information. There was great difficulty, owing to the hour, and other circumstances, in elucidating the facts. But if there had been present in the minds of those who conducted the investigation, a strong conviction of the primary importance of this question of velocity in the matter, it is pretty certain that we should have got a little nearer the mark than we can at present do.

There is thus no certitude that the speed was less than forty miles per hour when the fatal spot was reached. There is a high probability that it was more than thirty. Now, if we take the ordinary formula for the computation of centrifugal force, and apply it to the given curvature, and to the given weight of the engine, we shall see at once how vital a question is that of the actual speed. The centrifugal force, or tendency to leave the curve, due to an engine of the specified weight, is equal, at twenty miles an hour, to 1·02 tons; at thirty miles an hour, to 2·39 tons; and at forty miles an hour, to 4·38 tons. The counteracting tendency of the cant was equal to 1·09 tons. This tallies exactly with the allowance made by Mr. Laws, and with the adoption of a maximum velocity of twenty miles per hour.

There is more difficulty in stating what degree of lateral force is sufficient to make the flange of the wheel rise to the surface of the rail. As matter of pressure alone it is of course easy to compute the proportion between lateral pressure and tendency to rise. But the question is complicated by the friction of the wheels when borne hard against the rail. How much of the lateral force would go to produce heat, and how much to lift the engine, it is impossible to say without being in possession of accurate sections of the surfaces brought into contact. Apart from this important qualification, a lateral pressure of 55 lb. would be enough to make the wheel of an engine of the weight given rise ¼ in. per revolution, and thus mount the rail in about eight revolutions, or 176 ft. of line. We may approximate this important part of the case in another way. We have seen that cants of 1½ in. and of 3 in. respectively, counterbalance the deviating tendency for speeds of twenty and thirty miles an hour. If we suppose the outer rail to be raised 1 in. more than was the case at Morpeth, that is to say, to the height of 2½ in. above the inner rail, we shall obtain the cant proper (on the given curve) to a velocity of 26½ miles per hour. Conversely we may infer that beyond that velocity the only power which would have retained the engine on the line would be that friction which we have not the means of calculating,—the resisting power of which, moreover, would vary every second, according to the oscillatory motion of the engine, the curvature of the top table of the rail, and and other minute mechanical details. It follows that 26½ miles per hour would be a velocity at which the safety of a train over the curve would begin to be in peril; and that with any excess of this velocity the peril would increase, until there came a limit, which the above indications render probable to be considerably below 40 miles an hour,—at which the engine must unquestionably mount and leave the rail. That limit, we think there is thus every reason to believe, was overpassed on the occasion in question.

We offer the above calculations, not only by way of explaining the mechanical cause of the catastrophe on the 25th ult., but as indicating a general cause of danger to railway trains, which can only be obviated by giving the control of the whole arrangements of a railway to a sole person, and that person a competently-educated engineer. Without making any remarks that are in any way invidious, or calculated to throw blame on any person or set of men, we think there is great reason to doubt how far that is the rule with our railway companies. On the occasion discussed, one engineer gave evidence as to the locomotion, and another as to the permanent way, and we think it may fairly be conceded that both engines and road were in unexceptionable condition. But who was responsible for putting the two halves of the machine together? Who fixed the speed? It is hardly possible that any one but a thoroughly-educated mechanic would be aware of the extreme delicacy of a question of this kind. Few other men would realise the fact that a train might run at thirty miles an hour round a curve of one radius, and would infallibly leave the rails if driven at the same speed round a curve of another radius. Thus it is essentially necessary that the person who fixes the speed should be aware of the mechanical state, both constructively and as matter of maintenance, of every portion of the line. It would be necessary for some one possessed of all this knowledge, both theoretical and practical, to have a supervision, not only of the speeds according to the time-tables over any portion of the line, but also of the maximum speed which, under any circumstances, the driver of a late train should be allowed to make up. In a word, a perfect comprehension and control of the entire system, comprising way, engines, and maximum speed, ought to be in one breast—that of a thoroughly educated engineer. And if this fails to be the case, the public have no defence whatever from what may be properly called the natural mechanical results of disproportioned speed. The question is not one of reducing the velocity of the trains. One velocity (within certain limits) is as safe as another, provided all the arrangements are made to provide for that velocity. The danger is—not so much of the neglect of the maintenance of a line, as of the use, under circumstances of pressure, of a rate of velocity which was not contemplated by the engineer who laid the permanent way.

We earnestly hope that the above considerations may receive due attention. The class of accidents occurring from the engine leaving the rails is one which strikes at the very root of the reliability of the railway system. We have had repeated cases of this kind of casualty. In each, so far as our memory serves, the attention of juries and witnesses has been mainly turned to the state of repair of the line, or to any cause of disturbance, such as a fracture in the engine, a bolt or a stone on the rails, or what may be called a casual cause of mischief. We are not aware that the relation of velocity to curvature has ever been brought forward with that distinct emphasis that the nature of the subject demands; and we think that it cannot be denied that the attribution of this cause of danger of its due importance would entirely remove one great cause of a very fatal kind of casualties,—a cause which, in many cases, might result from the simple origin of a division of responsibility, and of the entrusting of whatever general control existed to a man who was not both a scientific and a practical mechanic.

This detailed inquiry into one case of a very important problem has the more importance from the fact that public attention is just now unusually active on the subject of railway casualties. Particularly does our view concern the directors of lines on which safety is questionable. We can readily suppose that many upright and honourable men have been lately shocked at the suggestion that the prevention of accidents has been regarded by railway managers as a question rather of pounds, shillings, and pence than of the highest moral obligation. We do not, in all candour, believe that there is a railway manager, or a railway board in the kingdom, that would decline to adopt precautions known to be indispensable to safety, on the ground of cost. It is true that the rate of compensation for personal injury on our great lines is only from two-thirds to three-quarters of one per cent. on the average of the gross revenues, although in two cases it has been to almost two per cent. In one it is as low as ·02 per cent. We cannot think that this has been regarded as a reason for omitting precautions; although a low compensation rate may in itself be taken as an argument of a high state of safety. But we think it is far more likely that casualties are to be traced either to divided control,—or to the placing control in the hands of men who, though admirable men of business, adroit financiers, men whose knowledge of the resources of a district, and of the best mode of developing them, may rise to the level of statesmanship, are yet not mechanics, either born or bred. Under the whole question of the financial success of a railway lies the mechanical question. The railway system is, first and foremost, a mechanical operation. It is one that deals with great weights driven at high velocities, and in which the slightest miscalculation is attended by extreme peril to human life. The general arrangement and comprehensive supervision of such a system can never be safely entrusted to any but a mechanical man. The attention, or the knowledge, of any other class of persons may,—and probably often does, fail at the very point of need. We are strongly disposed to believe that the responsibility, in face of the public, as well as in face of the shareholders, of an engineer who should control works, plant, and lines of trains, would be a better safeguard than any which has been yet suggested. From such an officer too,—if he were required as a necessary and integral part of the system of management, the shareholders would expect, and would be likely to receive, information which they do not now possess, which they cannot attain, and which it is of the utmost importance to their proprietary interests to have. Neither the returns of the Board of Trade, the reports of Captain Tyler, nor the half-yearly reports of the various companies, furnish any answer to the question,—How much does it cost to convey a passenger, or a ton of goods, for a mile on the line? We get, it is true, an average cost, and an average income, per train mile. But there is no definition, in any case, of what a train mile means. Whether it includes an engine, tender, break van and couple of carriages, or two locomotives and 90 or 100 wagons,—we have no means whatever of judging. It is clear that if, in a matter of such vital importance to the financial outcome of a railway, the shareholders are content to remain in ignorance of the very alphabet of their profit and loss account, it is small wonder that we find that many of these delicate mechanical provisions and precautions which make the whole difference between safety and danger, between life and death, are but too likely to be overlooked. The fact that we have 160 "train accidents" in a year proves, indeed, that such precautions are overlooked. We have the credit of being an eminently practical people; as such we are apt to turn with some scorn from anything intended by the word "theory." But theory may mean one of two very different things. It may mean something not very different from fancy, or it may mean the most sober, careful, and luminous outcome of all known facts; an outcome which serves to classify and to explain the facts themselves. This, we repeat, is yet wanting in our English railways. On the railways of France, of Italy, of America, of New South Wales, and of India, questions both mechanical and financial can be definitively answered which are altogether unsolved with reference to the railways of the United Kingdom. Not only are they unsolved, but the data for their solution are carefully withheld. We believe that there is a close and intimate connexion between the mechanical and the financial requirements of the railway system. We hold that neither one nor the other can be left subject to "rule of thumb" without danger, loss, and detriment. A thorough and perfect knowledge of the great problem of railway working and management is a result at which, after fifty years of practice, we have as yet failed to arrive. No passenger and no shareholder will be as safe as he ought to be until this reproach is lifted from our shoulders.

THE REVISED CODE OF THE INSTITUTE OF ARCHITECTS.

THE alterations in the rules of the Institute of British Architects, proposed by the Improvement Committee, having now received the definite sanction of the general body (with a few not very important modifications) we may consider them as open to public comment, and proceed to make a few remarks on the scope and spirit of the alterations, not so much in the way of criticism, since, as before observed, we entirely concur in them in the main, as with the view of bringing under the notice of those of our professional readers who are not at present members of the Institute, the efforts which have been made to provide for the adequate and suitable representation of the interests of the profession in town and country alike, and to afford at least the machinery for a more thoroughly national and representative Society of Architects.

A leading object, in the first instance, has been the complete elimination from the Institute of the representation of trade interests for the future. This was already the case in regard to strictly professional members, whether in the class of Fellows or Associates; the interest or participation in any trade, or the acceptance of any pecuniary consideration or emolument from tradesmen engaged on any work under his superintendence, being, by the original Bye-laws, a sufficient reason for the expulsion of any Fellow or Associate. That the first-named of these conditions has not infrequently been evaded or ignored is, we fear, the fact; but it has not, as far as we know, ever been condoned when formally brought before the notice of the Institute; and we can testify to the strong feeling exhibited

and expressed on this head by leading members of the Institute on not a few occasions. But the regulations under which non-professional persons were elected as Honorary Fellows and Contributing Visitors left no restriction as to connexion with trade interests; and although the distinction of honorary membership has always been conferred with due regard to high attainments in architecture and the higher walks of study connected with it, the rule electing Contributing Visitors has allowed opportunity for the singular spectacle (as we remember on more than one occasion when practical questions were under discussion) of an eloquent and impassioned address to a meeting in recommendation of some particular method or material upon the use of which the speaker's own business success depended. Any chance of future elections leaving liberty for this is done away with. The clumsily-named class of "Contributing Visitors" is eliminated from the books, and their place is supplied by dividing the Associates into two classes,—"Associates" pure and simple, who shall be, as before, persons "engaged in the study and practice of civil architecture," but not having been in business on their own account for as much as seven years, and "Honorary Associates" who shall be engaged in the study, but not the practice, of civil architecture, and correspond to the Contributing Visitor, but with the reservation that they shall be "unconnected with any branch of building as a trade or business,"—a limitation which is also now extended in the letter, as it was formerly in the spirit, to the class of Honorary members. Whatever may be said, therefore, by "London Parsons," or persons so signing themselves, who air their spite against architects in letters to the newspapers, about the corrupt practice of the profession, these candid people must, at least, be compelled to recognise the fact that the representative body of the profession has set its face against any malpractices with all the stringency that words and bye-laws can possibly ensure.

This is one step towards rendering more unassailable the *status* of the Institute, and another is to be found in the new arrangement for the election of the council and the higher officers of the society. This scheme, which has been suggested by that which is reported to have worked admirably in the Institution of Civil Engineers, provides that in nominating a list of members eligible for election to the council, a margin, in regard to numbers, shall be left (thus getting rid of the usual almost routine election of a "House List"); that from the council the vice-presidents shall be chosen in the order of their seniority to office; and from them, on the same principle, the president shall be chosen. There is a provision for the chance of a *nolo episcopari* on the part of any vice-president; but, apart from that, this arrangement ensures that the men regarded by the general body of Fellows as more efficient shall always be at the head of the official corps. Another decision, which we wish to class with this, though it is referred to in another section of the committee's report, is that after May, 1882 (originally 1880, but altered in discussion to the later date) all candidates for election as Associates shall pass an examination as a test of their professional training and capacity. This, which we regard as perhaps the most important step in advance taken by the Institute during many years, would, in conjunction with the scheme of election of council and officers above referred to, render membership of the Institute, and election to its higher offices, a really practical voucher for professional proficiency and distinction. It ought, if its value be properly recognised, both to raise the importance of the Institute very materially, and to do efficiently and widely what the scheme of the Voluntary Examination has only been able to accomplish in an exceedingly partial and tentative manner.

These are the most important of the new provisions which are aimed at raising and securing the professional status of the Institute of Architects. The next class of alterations refers to the means of making it more distinctly national in character. This includes what may seem a sweeping reform, since it is nothing less than doing away with all distinction, except in regard to one or two minor details, between members practising in London and those practising in the country. The subscriptions are all equalised, and all special conditions about the representation of country architects in the council, &c., are withdrawn. The object of this was, we believe, misunderstood by some of the existing country members, who thought they were to be left out in the cold; and some came up to the special meetings on purpose to protest. In most cases, however, the result was that,—

"Those who came to scoff remained to pray,"

or to praise, at all events. The object of the whole legislation on the subject is that there should be no invidious distinction whatever between members in London and members out of it,—the Institute is to be emphatically not one of *London* architects, but of *British* architects; and the provision for the presence of a certain number of "country members" on the Council is withdrawn, simply because on the new system all the members of the Council may be country members, and any country member may be on the council, if it suits him to stand, and he has attained sufficient distinction in the profession to be chosen.* One or two modifications of the previous rules are made to facilitate the election of those living at a distance from London; for instance, in such a case the demand for the recommendation of three Fellows from "personal knowledge," which might be a difficulty for an architect practising in a provincial town, may be set aside so far as that such a recommendation from one Fellow may suffice, coupled with the recommendation of the president and three professional members of any local Society of which the candidate may be a member. But the recommendation for membership in any case is to be far less of a mere form than it sometimes has been under the old regulations. The nomination paper must be accompanied by a separate written statement by the applicant as to his professional education (in the case of Associates), and as to his professional education and works (in the case of Fellows), and by another written statement by one of the three Fellows who have signed the nomination paper, giving particulars of his acquaintance with the candidate and his works. All this tends to show that there is a determination that qualification for membership of the Institute shall really mean a good deal in future. Perhaps we may be allowed to hint that these conditions will be hardly consistent with the continuance of a practice which we believe has more or less been carried on (whether with the direct sanction of the Council or not) of writing to architects not already members and suggesting to them to enrol themselves; a mode of procedure which seems to us to be little consistent with a due regard to the dignity of the Institute, and which would, at all events, be totally inconsistent with a reform the best feature about which is that it aims at rendering qualification for membership a real and *bonâ fide* testimony to professional capacity and *status*.

In connexion with the subject of professional status we may observe also that the new rules draw a distinction in regard to one point which it is believed has been misunderstood, and has deterred some provincial architects from joining the Institute ranks, under the idea that they were required to bind themselves not to furnish quantities for their own work. A certain degree of verbal confusion on this point has been removed, and the wording of the new bye-laws makes it clear that any architect is at liberty to supply quantities for his own work, only on the understanding that they are paid for by the client direct and not by the contractor. The principle enforced is simply that the architect is not to make himself in any sense the servant of the contractor, which is a wrong position for him, either in the interests of himself or of the clients whose representative he is. For ourselves, we object entirely to the practice in question, as one eminently calculated to place the architect in a false position; but we understand there are supposed to be difficulties in doing away with it entirely in provincial practice.

The question of the relation of the Institute to kindred societies is not made the direct subject of any legislation, and hardly could be; but it is treated of in the Report of the Improvement Committee, whose suggestions, with one or two modifications, have been adopted as a basis of future action. The suggestions of the Committee went to the effect that the Institute should keep up a systematic interest in the proceedings of provincial societies, and a correspondence with them; suggesting as a means to this end that a list of the leading Architectural Societies of the kingdom, and the names and addresses of their presidents, secretaries, and professional members, should be kept duly filled up, and that copies of the sessional papers, and particulars of the architectural examination, and the various prizes of the Institute, should be from time to time officially forwarded to such Societies, together with "such other information as to the proceedings of the Institute as may tend to bring the corporate representatives of the profession throughout the kingdom into useful co-operation." This, it was suggested, would be a better principle than that of attempting any official union between local societies and the Institute; the object being rather that all architects of standing in the provinces should be members of the central and national Society, the local societies preserving their independent action. This, we think, is certainly the better principle, as the local societies will always have local affairs of interest to look after which would be more or less beyond the proper scope of a central body. Nor is there to be any more talk at present of amalgamation of the Institute and the Architectural Association; which also is a wise decision. The Association was established with different objects, and is doing its own special work very ably; and it is much better that it should keep its special character.

Other changes in matters of detail have been made with the view of increasing the utility of the Institute in the promotion of the study of subjects connected with architecture. The most important of these is the proposition, which will require a little special arrangement for carrying it out, to keep the library open every day from 10 a.m. to 9 p.m., instead of opening it on three evenings only of the week; and that duplicates of the standard works most referred to should be provided and lent under certain conditions for home study. This would be a very useful provision for younger members especially, and the more constant opening of the library would save a good deal of inconvenience. From whatever cause, it is certain that the library of the Institute, considering what an admirable one it is, is of less practical use at present than one would suppose it might be. Then there is an important change in the regulation of the ordinary meetings, which provides that the paper of the evening shall close the proceedings, and the discussion upon it shall take place at the following meeting, before the paper for that evening is read. The object of this, of course, is that members wishing to comment upon the facts or views advanced in the paper should have time to consider the subject, and mature what they have to say, instead of getting up and talking on the spur of the moment, and that the discussion should thus be of more practical value. This is meant very well, and may work well; but it is a point we feel a little doubtful about. At all events, in that case, a tight hand will have to be kept over the discussions, lest they should encroach unduly on the time the reader of a paper has a right to expect; as it is, the paper of the evening is often forced to too late in the evening, through the extension of preliminary business. On the other hand, it is desirable, no doubt, that the discussion of professional subjects should not degenerate into mere complimentary talk, of which there is often a good deal too much at Conduit-street. And whilst on the subject, we cannot help observing that there is a very general feeling among the majority of those who attend the ordinary meetings that so-called discussion runs far too much in a groove, being, in fact, placed practically in the hands of a few members who are constantly called on from the chair in rotation,—a practice which prevails at the Institute to a degree which we seldom see at any other meetings of this kind. The consequence, of course, is, that a member often speaks merely out of politeness, because he is called on; and that those who are not so invited, and who may have something really to the point to say, are unwilling to do so unasked. We have heard sufficient remark and complaint in regard to this feature of the Institute meetings to feel justified in calling attention to it. At the same time, if there are no volunteers, the chairman must do his best to press good hands.

Several schemes, of various extent, have also been proposed, in regard to enlarging and improving the premises of the Institute, and to some extent this is, we believe, to be done at once; a resolution which those who know the room in which the architects hold their meetings will not be slow to appreciate. Seat arrangement, ventilation, and decoration, are all capable

* We would suggest that in connexion with this laudable endeavour to give a more national character to the proceedings of the Institute, it would be worth while to reconsider an idea that has been before brought forward, of holding Conference meetings in the leading provincial towns, on the principle so successfully adopted by the British Association.

of much improvement, even without acquiring an extension of the premises; and we would suggest that the means for exhibiting diagrams should be considered. The process of hanging drawings all on one side of the room, instead of fronting the audience, seems most primitive; certainly the result is, that only a few fortunately situated persons can really see a number of diagrams so as to follow any reference to them with ease or comfort. One of the more extensive improvement schemes suggested involves the acquiring of the ground-floor, and providing there a members' club and reading-room. This would be particularly useful to provincial members when on a visit; but, of course, such large schemes as these presuppose a sufficient increase of income. Under this head the report offers a pretty encouraging prospect, which we see no reason to think is exaggerated. The income of the Institute has been increasing very rapidly of late years; but then its expenditure has increased also through new undertakings, such as the Conferences, &c. The scheme of erecting an entirely new building of such a character as to be a worthy home for the representative body of the architectural profession has been once or twice mooted in our columns. No reference is made to such an idea in the report of the committee; it would, of course, involve an expenditure only to be met either by a greatly increased income, or by special subscription.

Everything that is needed might be done, however, if the Institute, under its new regulations, meets with the recognition and support from the profession at large, which we desire to see, and which we believe would be advantageous to all concerned. The Architectural Union Company would, we have no doubt, enlarge their capital if necessary, and do all that could be done for the Institute on their side, if a corresponding rent were assured. It is with the view of obtaining support from those of our professional readers who are not now connected with it that we have drawn attention to the subject. We repeat what we have before said, that we are not occupying the position of blind advocates of the Institute as now existing, or of those particular members of the profession in London who have drawn up new rules and improvement schemes. We speak on the widest ground, as the advocates of the whole profession; believing that a greater and more general union of English architects, with the object of aiding the progress of the art and science of architecture, and raising the social and moral *status* of the profession to the highest point, must be a benefit to all concerned. We point out that a very able and honest effort has been made, at the expense of much time and thought, to provide a machinery by which this high object may be realised. Those who have framed this machinery have done their part. It now rests with the profession at large to effect the realisation of this object, by combining to render the central society in fact, as well as in name, the Institute of "British Architects."

ARCHITECTURAL PRACTICE AMONG THE GREEKS.

THE Eastern Question is at the present time such a burning subject that caution is required in mooting it in too close proximity even to matter so happily uninflammable as the neutral columns of an architectural journal; otherwise occasions are not lacking when reflections might be indulged in naturally enough even here, as to the benefits with which Greece has overpaid the tardy and chary, and, at last, the begrudged and unintentional assistance which Western Europe gave to her emancipation. No doubt the enthusiasm of the more sympathetic has had its disappointments, but that is no more than enthusiasm and sober-minded confidence in justice also, must be prepared for: the blood of the martyrs was the seed of the Church, and free constitutions spring up at last, but not ever immediately, upon ground well sodden with that of patriots; and truth and honesty, intelligence and culture, peace and prosperity, are not to be despaired of because the first consequences of a revolution that humanity has been groaning for seem but groans again. Modern Greece, with all its shortcomings, is a vast gain to humanity, as all know who are familiar, as some of us are, with what was told—as more with what was written—by the travellers who knew it in slavery; how valuable and welcome an ally of science and art combined it is gradually becoming is being proved by the illustrations of history, architecture, and sculpture that are now recovered and recoverable at Olympia and Mycenæ. Under all its disadvantages as capital of a too restricted territory, Athens is a centre of no inconsiderable group of native men of learning, as of institutions of culture and museums constantly enriched. In this group the pride of descent, for ever stimulated by local associations, is burning, not without effect, in the brightest form of an ambition to imitate—to emulate ancient intellectual glories, and as a noble beginning, within their reach, to do their duty towards the remains of which they are at once heirs and trustees in the interest of all progressive civilisation.

A bi-monthly periodical,—the *Athenaion*,—printed at No. 2, Street of the Muses, is a not unfrequent recipient, among miscellaneous essays and dissertations, of notices of antiquities as they come to light, and among these, of inscriptions. As modern Greek is written by men of education, it presents very few difficulties to those who are moderately familiar with even the easier ancient authors; after a few corrupt or intrusive particles have been recognised, and a few substitutions for some inflections noted, it may be read currently, the majority of unclassical words being for the most part transfers from Latin, or occasionally Teutonic, dialects. The number of the *Athenaion* which is before us contains an article, recommended by the welcome signature of M. Stephanos Coumanoudes, with the copy of an inscription of nearly 200 lines, which vies in interest with those relating to the Erechtheum at Athens. It comes from Lebadea, in Bœotia, where an Athenian gentleman caught sight of it built into the wall of a blacksmith's smithy; he gave notice to the Archæological Society at Athens, who immediately took measures to secure the stone, and the inscription is now published, from copies as careful and complete as circumstances allowed, and collated with a paper rubbing. It is nothing less than an architectural contract and specification of works of repair and construction about a temple at Lebadea, of which we have other notice, and of which, indeed, ruins still remain to the south of the modern town. Pausanias, who went through Bœotia about A.D. 174, visited this city, which he describes as on a par with any other in Greece, however prosperous in respect of its monumental adornments. The temple of Zeus Basileus,—of Jove the king,—was, however, then unfinished, either on account of the too large scale on which it was planned, or interruptions by incessant war,—and unfinished it doubtless remained till the time came for it to be demolished.

The inscription was certainly extended to three stones, as that which is preserved betrays continuation both at beginning and end; only the second half of what we possess deals with the work upon the temple,—the half which is doubtless the most interesting, but withal the most difficult; and further study is required before it can be satisfactorily meddled with. Even in the first part, which shall now be treated of alone, there is much which seems to demand, as the Athenian editor observes, something approaching to divination to interpret it. We are not only troubled by certain doubtful readings, and beset by words which are unknown to the lexicons, but even when translation seems tolerably authentic, the reference of the work, as specified, to what we know of such work as completed, is often a mystery indeed. This first part of the lapidary document, where difficulties enough crop up, but still more sparsely than in the second, refers to work to be done upon certain *stelæ* within the precincts of the temple, which seem to represent tall blocks, or superposed blocks, set upon bases, and surmounted by cornices or cap-stones, and bearing inscriptions. They might be taken for ancient funereal *stelæ*, such as are preserved in abundance in Greece, which consist of thick slabs crowned by a fleuron or conventionally floreated ornament, but that no hint occurs to point in this direction, and the letters inscribed seem to have counted up to thousands.

The parties to the engagement are the *Naopoioi*, the temple-makers, in fact, the official building committee, and the architect on the one hand, and on the other the contractor for the works (*ergones*) and his sureties, and possibly, as additional works may be required, a secondary contractor, literally, a "purchaser-in-continuation,"—a new word, and sureties on his behalf. In the second half we have an under-architect, or clerk of the works.

The commencement, as we have said, is lost, as well as three half lines at the beginning of what remains,—the fragments of these intimate a question of 5 per cent., and apparently a set-off (but here comes in an unknown word) and certain penalties; the next complete lines speak plainly enough,—the committee, or, let us call them, the controllers, shall exact the whole sum in question, whatever that might be, from the contractor and his securities, and if they cannot effect this shall sell them up. It is not easy to bring what follows immediately into a harmony of technical and grammatical construction; it seems to be agreed that bronze, the steles, and their cornices are to be provided for the contractor,—he may use what stone he finds for levelling the ground,—he will himself provide coarse or porous stone for the sub-basements or lower courses of the bases, and be paid 5 drachmas for every one he supplies; for cutting and *encausis* of the inscriptions he will be paid at the rate of a stater and three obols or about a guinea, for a thousand letters. This confirms what we know from other sources of the custom of the Greeks to add colour to engraved inscriptions. After receiving a payment in advance, the contractor shall proceed to work within ten days, employing not less than five duly efficient workmen, and if he fails to adhere to the written agreement in any respect, or is convicted of bad workmanship in any point, he shall be fined by the controllers, according to what appears the extent of his fault in varying from the agreement. And if any other of the associates in the work is detected in bad workmanship he shall be expelled from the work, and no longer be an associate; and if he is contumacious he also shall be punished along with the contractor. "And if in the course of the work it should prove desirable to do less or more in any degree than what has been written down, he shall act as we give order, and neither the original sureties nor the contractor shall be released from the contract until the new purchaser of the secondary contract has provided responsible sureties, and in respect of what had been done previously the original sureties shall continue such until the work is finally passed as approved." It is then provided that the contractor shall avoid damaging any of the existing works within the sacred precinct, and in case of such damage he shall make it good at his own expense and within whatever time the controllers determine; and if the "contractor of the setting," who does not appear to be a different man, shall ruin a sound stone in the course of working it, he shall provide another approved stone at his own expense, and not obstruct the progress of the work, and shall remove the spoilt stone from the sacred precinct within five days, failing which the stone shall be sacred,—that is, forfeit. And if he does not make substitution for, or remedy damage, the controllers shall estimate it, and the contractor shall pay what it amounts to and half as much over. But if any stone is wasted in consequence of natural defect the contractor of the setting shall not be answerable in respect of that.

Any difference which may arise on the part of the contractors respecting the terms of the agreement shall be decided by the controllers on oath, in view of the works, and the decision of a majority of them shall be final.

If the controllers in their delivery of the stones cause hindrance to the contractor, they shall make allowance for the time lost by such hindrance.

The contractor having appointed sureties according to the law, shall receive the first instalment of the full amount of his contract respecting all the stelæ and the cornices surmounting them, minus one-tenth of the total; and when he exhibits them all wrought and true every way, and completed according to the agreement, and ran with lead to the satisfaction of the controllers and the architect, he shall receive the second instalment in respect of the letters of the inscription by valuation reckoned according to the number taken from the copy, minus a tenth again.

And when he has finished the entire work, and it has been passed as approved, he shall be paid the outstanding tenth, and the value of whatever coarse or porous stones he has fixed; and whatever letters he may engrave after receipt of the instalment he shall be paid for these also when he receives the tenth, after deduction of anything that may be chargeable to him in respect of forfeit.

If anything extra is required to be done for the advantage of the work, he shall execute it on like terms, and receive what accrues to him on delivering it to satisfaction.

If the site proves soft when it comes to be

cleared, he shall complete a foundation with as many coarse stones as there may be need for, and shall receive what is due to him for this in addition along with the tenth.

He shall also fix upon the stelæ, the existing eleven cornices (or coping-stones) after he has first dressed the stelæ with such extension as we prescribe beyond the given circuit (?). He shall extract as many of the clamps at present in the stelæ as project and interfere with his operation of dressing, and drilling them deeper shall fit them and run them about with lead satisfactorily; and he shall also put clamps into these pins or bolts, and run them about with lead, and work all precisely as has been written respecting those above.

The language of this paragraph, assuming the readings to be correct, is distinct enough, but it seems to be at odds with any consistent meaning: this is one of the difficulties that diversify the employment of an interpreter; on the whole, it is perhaps more provoking than the cases where there can be no doubt as to the meaning that must have been in the intention of the writer, though his words can scarcely be tortured into covering it. The ensuing sentence brings us into still a third form of difficulty worse than either of the specified; cornices or coping-stones of 6 ft. and 5 ft. square (?) or matching some others, are apparently to be contracted for, but four others of 3 ft., to go two and two to a cornice, are to be provided.

The contractor will receive an instalment in respect of these cornices, and when he exhibits the stelæ wrought and set up erect, and run with lead, and the cornices which are fixed upon them clamped at the head (?), he will receive an instalment in respect of these also, minus the tenth, as written in instances above. And when he has fixed the cornices and exhibited them in position, leaded, complete, clamped at the head, corresponding satisfactorily with each other, he shall then cleanse the stelæ with soda, and deliver the letters (of the inscriptions) clean, and go on cleaning them as long as we require.

As regards any other matters which are not written down in the agreement, be these in accordance with the "Catoptic and Naopoiic law."

The law referred to here is doubtless a municipal Building Act, regulating the duties and responsibilities of district or other surveyors,—for *catoptes* is a surveyor or overseer,—and also the general regulations to be observed in dealing with temple architecture especially as under the surveillance of the Board of Naopoioi, who are so prominent in the inscription; it is with no little regret that the primary suggestion must be surrendered by those who not unnaturally seized on the new word "catoptic" as a hint of even the legal sanction, and, indeed, enforcement of observance of those optical refinements which gave the last grace to the temple architecture of the Greeks. There is, however, no room for even discussion upon the subject.

M. Coumanoudes justly refers to an inscription from Tegea, with a law respecting contracts as a general equivalent of that referred to here. It is, therefore, scarcely worth noticing that optical considerations of special delicacy, and such as had proper reference to the construction of such buildings as temples, could have no application to work of the nature of that to which the proviso is appended.

The second half of the inscription, however, which directly concerns the Temple of Zeus Basileus, is not wanting in stipulations which go far to explain how it was that such extreme accuracy of workmanship was secured by the Greeks, as we marvel at in more instances besides the Parthenon. This portion of the inscription, however, must wait awhile for its turn of illustration. To elucidate it thoroughly will try more than even tolerably strong Greek teeth. It may be hoped that some of the difficulties will vanish with a revised text, as both the copies and the paper impression were taken when the letters had not been cleaned of hard accretions so far as may yet be possible. Even from what appears at present there promises to be no slight difficulty in matching the prescribed treatment of certain stones with what we can identify in the architectural members which seem certainly in question. The editor declines to offer any suggestions of his own. "Whoever," he says, "shall succeed in a full interpretation, in his favour I cheerfully forego any priority of thoughts of my own, and the honour that may pertain to them."

Perhaps it may be possible to overcome the first impressions of desperateness by a few more re-readings, and to pick out some details of ancient practice which may be of interest, while we decline perforce the ambition of attempting the full interpretation which is desirable. Should this prove to be the case, we may return to the Lebadean contract and specification.

THE ANCIENT MONUMENTS BILL.

WE have already commented on the arguments used on the occasion of the second reading of Sir John Lubbock's Bill, when it was eventually referred to a Select Committee, but in view of the importance of the measure must return to the subject.

We do not for one moment admit the truth of Lord F. Hervey's statement, that when there is anything worth preserving people preserve it. When Sir J. Lubbock's previous Bill was before the House,—differing little from the present one,—the site of Avebury, one of the most interesting of the Druidical remains in this country, was actually sold for building purposes, and that national monument would have been a thing of the past if Sir J. Lubbock had not stepped in and purchased it. We think our monuments ought not to be left to such a chance. Lord F. Hervey went on to utter sentiments which, we trust, are not shared by many others. He did not understand why it was that people should be called upon to exhibit enthusiasm for the monuments of that barbarous and uncivilised race whom our fathers took the trouble to expel from the country. He objected to preserving the relics of the ancient Britons, which were destitute of all art and of everything there was noble, or that entitled them to preservation. To this we answer that he is not called upon to exhibit the enthusiasm of an archæologist for these remains, but we shall say it is the duty of every Englishman to assist in the preservation of remains which throw light upon any portion of the national history.

Mr. Leighton thought that the best way of preserving old monuments was to leave them to the care of the archæological societies, who could purchase and conserve them. The income of the various societies of that character is very limited, and generally absorbed by the issue of their "Transactions," and other necessary expenses. In exceptional instances they might induce persons to subscribe towards the purchase of some particular monument; but their own funds, and those they might collect, would be totally inadequate to the systematic purchase of those remains. Many of these societies do much good in supporting local museums, which, in a minor way, preserve interesting relics of the past.

Some members objected that the Bill would give the members of the Commission too much power in the purchase of land on which these remains are situated, but it is sufficient to say that the wholesale purchase of sites is not contemplated. The Commissioners will only purchase when the owner of the site determines to destroy the object, or by his continued neglect places it in peril. The interesting Cæsar's Camp at Wimbledon was most wantonly destroyed by the owner, a member of the House of Commons. He had been remonstrated with in vain, and we believe between 5,000*l.* and 6,000*l.* had been collected to save it. This valuable object would have been saved if some such measure as Sir J. Lubbock now proposes had been in existence.

Touching pictures were drawn by some of the evil this Bill would work in case railways or sanitary improvements were to be carried on over the sites of these monuments. It may well be answered that these cases would be very rare, and as the Commissioners would be carefully selected, they might be entrusted to act judiciously. A good deal was said in the debate as to why Mediæval monuments were not mentioned in the schedule, but we think if must be conceded that these are just the objects to be entrusted to the good feeling of people, but that it is just those memorials which do not appeal to the taste and enthusiasm of the majority which need to be placed under the fostering care of the Commission.

Monuments of the character dealt with by the Bill are disappearing with great rapidity. We can understand the destruction of large portions of the great Roman wall in the first half of the eighteenth century to mend the public roads. Here and there an enthusiastic antiquary, like Dr. Stukeley, might protest against this Vandalism; but archæology, as a science, was almost unknown at that period. In the time of Charles II. there were sixty-three stones at Avebury, in Stukeley's time twenty-nine, and now about seventeen. Eight years ago the "Great Tolmen," one of the most interesting antiquities of its kind in Cornwall, was destroyed for the sake of the granite on which it stood. No remonstrances could prevent a farmer in the succeeding year from ploughing away part of the celebrated Dorchester Camp near Oxford.

In more distant places the destruction has been very great. In some cases we are aware that the supposed magical qualities of the object have saved it from destruction. We allude to cases like the holed-stones of Cornwall, which are crawled through by rheumatic and other patients! A feeling of this character has been the destruction of the carvings at the base of the great cross at Clonmacnoise, for the peasantry are continually stretching their arms round it. It is probable that no country has suffered by the destruction of monuments like Ireland. Dr. Stokes, in his "Life of Petrie," says,—"The number of ancient remains that even during the last century have been wantonly destroyed is so great that their enumeration would be tedious." Sir John Lubbock states that an Ogham stone had been destroyed at Clonmacnoise, interesting as being one of only three cases in Ireland where the inscription in Ogham was accompanied by one in Roman characters. The Palace of Emania, near Armagh, has been destroyed, the owner saying, when remonstrated with,—"Ireland has no history." The great Rath, or Pagan Fort of Kilbannon, built on the conversion of the native chief by St. Patrick, has disappeared. The same fate will soon attend the ruins on Holy Island, in Loch Deary, erected by King Brian Boru. In seventy years, more than forty of the round towers of Ireland have been destroyed. The early Christian inscriptions at Innes Murray were perfect about forty years ago; they are now all gone but one.

The round tower of Dungiven was destroyed because treasure was believed to be concealed in its foundation, and that of Drumcliff because the materials were required for a new bridge! Thirty years ago the proprietor of the remains of the church and round tower on Ireland's Eye caused them to be taken down because he feared they might fall on his cows. An archæologist went recently to see the Long Stone, a monolith described by Rudden in his "History of Gloucestershire." A farm labourer told him that he was too late, as the stone had been blown up and taken away because it interfered with farming operations. Sir J. Lubbock stated that there was only one case in which we had the actual expression of Shakspeare's own sentiments, and that it was one bearing directly on the object of the Bill. There was in his day a question of enclosing some land near Wilcombe, on part of which there was an old camp, known as the Dingles, commanding a ford over the river near Stratford-on-Avon. An agent named Greene (a cousin of the great dramatist) was sent by the corporation to "watch the case." Under date September 1, 1615, Greene writes in his diary that Shakspeare had said that he could not "beare the enclosing of Welcombe."

The instances of destruction,—and they might be largely multiplied,—show incontestably that some measure for the protection of our national antiquities was needed; whether Sir John Lubbock's Bill is everything to be desired, is another question. As we have before remarked, the Bill has been referred to a Select Committee, and its clauses will be curtailed or extended, as will appear best for the public weal. We trust members will remember the words of the late Prince Consort,—"Everything is valuable which marks the taste, good or bad, of any period of our history."

Eight years ago we listened in the Town-hall of St. Alban's to an eloquent address by Lord Lytton to the members of the British Archæological Association. He was careful to point out that in proportion as we cherished the memories of our ancestors, and revered the heirlooms they had left us, we felt that patriotism was no idle name, but the mainspring of every policy which made statesmen wise, and the borders of a State secure. He quoted the well-known passage of Gibbon, which gives such a mournful picture of Roman corruption and decrepitude, just before the final extinction of the Western Empire, and the accession of a barbarous king to the throne of the Cæsars; the historian observing that the monuments of consular or Imperial greatness

were no longer esteemed but as an inexhaustible mine of material, cheaper and more convenient than the distant quarry. For the information of Lord F. Hervey, we may mention that his lordship especially pointed out that the ancient Britons were not the ignorant barbarians some have called them, for their skill in agriculture was considerable, and they had in familiar use implements and machinery, such as carriages, the water-mill, windmill, &c.

Up to this time we have been very unfortunate in our attempts to put a stop to the wholesale destruction which has been for years going on among our national memorials. Look at the fate of the Sepulchral Monuments' Report, designed chiefly to prevent more havoc in churches under the zeal for "restoration." In February, 1869, the First Commissioner of Works (Mr. Layard) requested the Council of the Society of Antiquaries "to furnish him with a list of such regal and historical tombs or monuments existing in cathedrals, churches, and other public places and buildings as in their opinion it would be desirable to place under the protection and supervision of the Government, with a view to their proper custody and preservation." The Council assented, and the committee appointed by it decided that the inquiry should be limited to monuments of persons who died not later than the year 1760. Reports by local secretaries and others were furnished, and a selection of 79 regal and 531 historical monuments was made. The report was ready on March 18, 1872; but Mr. Ayrton had succeeded Mr. Layard as First Commissioner of Works, and he informed the Society that the Government had no intention either of introducing a Bill, or of laying before Parliament the report which the Society had prepared.

Though the labour had been practically in vain, the report showed the necessity for some measure of the kind. It stated, "A church which to-day seems liable to molestation, may to-morrow, at the suggestion of an ambitious architect, an ignorant committee, or a speculator in glazed tiles, be turned inside out,—chantry chapels destroyed, and tombs needlessly removed from the honoured graves which they once marked,—the modest slabs which recorded the burial of persons of historical importance allowed to be broken and carried away; or even, as in the cases frequently reported to the Society of Antiquaries, the floor of a country church with all the inscribed flagstones may be permanently concealed by a new encaustic pavement." The latter was actually done at Low Leyton, in Essex, effectually concealing the tomb of John Strype, the antiquary. During the progress of the so-called "restoration" at St. Mary's, Lambeth, the marble slab forming the sole sepulchral monument of Archbishop Bancroft was broken, and either covered up or destroyed. We should say that during the last 200 years at least some thousand brasses have disappeared from our churches, many of them very recently.

An amusing story is told of the grandfather of the Marquis of Downshire, who, being informed that Con O'Neil's castle at Castlereagh was dilapidated, wrote to his steward, ordering a wall to be built round the castle field. The steward set about building it at once, *using for the purpose almost every stone of the old castle which the marquis desired to protect.*

In England, thirty-five years ago, archæology was hardly studied as much as it had been under the Gales, Thomas Hearne, and Stukeley. France was far ahead of us in this respect, and soon took active measures for preserving and publishing its written records of history, and also to prevent the further destruction of its historical monuments and antiquities. As early as 1830, money was annually voted for these purposes, and the general interest in them kept up by such publications as M. de Caumont's *Cours d'Antiquités Monumentales*, and his *Bulletin Archæologique*. At his suggestion, we believe, a Société pour la Conservation des Monuments was founded, and saved many minor memorials by timely grants of small sums. Without these aids the great castle of Pierrefonds and Chambord, the ancient episcopal palace at Avignon, the Roman Amphitheatre at Arles, would have perished like the château of Jehan de Joinville. The Government of Napoleon III. allowed the Inspector of Historical Monuments to spend a million of francs annually upon these memorials, and he was assisted by an ample staff in the performance of his duties.

Germany has an inspector of monuments; Italy has done good work in the same direction; but Denmark has set an example to more important nations. It has long been the practice there to purchase tumuli and megalithic remains by the Government, and thus her primæval remains have been admirably preserved. She has long had a sensible law of treasure-trove, and her museums are enriched accordingly, while, up to 1862, by the insanity of ours, thousands of interesting objects find their way into the melting-pot. Holland should also be mentioned as a country which had conserved its national antiquities. According to Mr. A. W. Franks, there are in Drenthe, one of the least wealthy provinces of Holland, fifty-four megalithic monuments formed of huge boulders, and resembling our cromlechs. They are locally known as *Hunnebedden*, or Hunbeds. In 1868 the attention of the State of Drenthe and of the Dutch Government was called to the destruction of these remains in a pamphlet published by Mr. O. Gratama. Funds were at once placed at the disposal of the governor of Drenthe, and he was able to secure from further destruction forty-one of these memorials. The custom in Holland is to purchase a quadrangular plot of ground, leaving room to walk round the cromlech. The corners are marked by posts, and a narrow roadway is secured leading to the nearest highway. In the case referred to, the care of the remains was confided to a commission at Assen, the capital of Drenthe, and their preservation was recommended to the burgomasters of the communes in which they are situate.

It has never been sufficiently impressed upon people that objects of antiquity lose half their interest, at least, when removed from the locality in which they have been found. We do not mean that it has been the practice to remove cromlechs from their sites unless for destruction. Of course, we allude to the minor, but extremely interesting, memorials of past ages. When a coin, jewel, vase of pottery, or other object, is sent off to the British Museum, to appear, with hundreds of others, on shelf or drawer,—if it has the luck to be exhibited at all,—the principle of association, which lends so much charm to archæological research, has been lost. It should be placed in the nearest local museum, *properly labelled*,—how many antiquities have lost their value for neglect of this simple rule,—and the multiplication of such objects will supply materials for the history of a district.

But it is unfortunately the case that these local museums have not received the attention they deserve. One would think that people would be glad to provide some place in which to store such objects for reference; but from a pretty extensive acquaintance with the local museums of England, we can say that the apathy of people respecting their local history, as exhibited by "finds" in the neighbourhood, is absolutely astonishing. As a rule, the people in a town or village are almost the last to take the trouble to secure such antiquities, and allow collectors from a distance to enrich their collections, unless they are roused by a sense of shame, produced by pressure from without.

We trust something may soon be done to encourage the museums which have been founded, and to establish others in localities where they are needed. It is by the accumulation of details that history is written and archæology elucidated, and it would be almost impossible to overestimate the importance of a series of firmly-established local museums throughout England for the preservation of minor local objects of antiquity, affording, as they would, abundant materials of every period of our history. We are perfectly well aware that there are still in some towns museums which are a credit to their founders and custodians, but the condition of the majority induces us to think that help should be afforded them, either by Government or by a well-organised society which could encourage them by small grants or stimulate local interest in their favour.

One reason for the state of decay in which some of these institutions are, is, that they have been expected to support themselves. In all cases where possible, they should be established under the fostering wing of the local archæological society if one exists; if not, in connexion with some kindred society. Nothing should be charged for admission. If local magnates would only consider what a means of elevation is provided for the masses by a well-appointed museum, they would be more eager to establish them. It is an error to suppose that they are not popular. The Museum in Colchester Castle, chiefly supported by the Essex Archæological Society, had 10,155 visitors during 1870; five years after the number had risen to 15,795. This museum, one of the best in England, is free.

PROFESSOR E. M. BARRY ON ARCHITECTURE.*

TOWN ARCHITECTURE AND MODERN PROBLEMS.

WE have traced, on former occasions, the various stages of development in the domestic architecture of this country, and have glanced rapidly at the changes which gradually transformed the hall of the Saxon Thane into the Mediæval manor-house of the fifteenth century. From that period, the differences which ensued were differences of degree rather than of kind, and we find in the Elizabethan and Jacobean mansions arrangements which are, more or less, in accordance with the requirements of our own day. I may return hereafter to this part of my subject, but for the present I pass it by, in order to consider some matters of more general interest, affecting the transition from Mediævalism to modern life, and the problems with which the architect is consequently brought face to face, in the application of his art.

In London, as we have seen, old things have almost entirely passed away, and we have to deal with new conditions. The Great Fire destroyed the picturesque, but inconvenient, dwellings of Old London, and gave an opportunity for improvement, such as has seldom occurred in the history of a great city. We, in this generation, are not, happily, likely to have a similar chance; but great changes are nevertheless taking place amongst us, and we may usefully consider our principles of action in the architectural treatment of great cities, as well as the important laws which should govern such action, by subordinating our arrangements to the ascertained truths of economical and sanitary science.

We often hear laments on the extinction of good taste. All, we are told, is common and vulgar, and we are daily plunging into lower depths of artistic bathos. Railways and kindred inventions, which have done so much to increase the power of man over matter, are complained of as the executioners of art; and, in the opinion of some, all that we have to do is to seclude ourselves from such base associations, and draw gracefully around us the garment of refined exclusiveness, before we bid a final farewell to a vulgar and pushing world.

This spirit is not uncommon: it finds vent sometimes in laments over all that has made our country great among the nations of the world, sometimes in pensive regrets over the colour of a fabric or the pattern of a coal-scuttle. It may, however, be doubted how far such despondency is to be justified by facts; and, still more, how far it is likely to be profitable for improvement in art. We may start by agreeing that ugliness is common enough, without conceding that it must so increase as ultimately to overwhelm us.

Good taste, if not common among ourselves, has ever been the heritage of the few. Is there less of it at the present time? or is it the fact that the many have come more to the front, and that their requirements have thus acquired a special prominence? We are not able to assume that, even among the Greeks, good taste was common. The buildings which are left to us are precisely those on which we should expect to find that every resource of art had been lavished. Of daily life in ancient Greece we know little, and we cannot assume that it differed greatly from what our own would be under similar circumstances. Different times and circumstances lead to different manners, and the problems we have to solve, in this anxious and brain-busy nineteenth century differ, as greatly from those which presented themselves in the morning of the world's history, as do the grave pursuits of a modern philosopher from the happy and graceful gambols of a child amongst her flowers.

Modern civilisation may sometimes seem to repress individuality, and its progress to resemble the march of an army, treading steadily, with a common step. But this is not the whole truth. If it be true that it is rarely given to one mind to strike out novelty of a startling nature, and conquer by the flash of genius, it may be remembered that our army of progress resembles a column which never retreats, and in which each backward rank treads in turn in the footsteps of the more progressive pioneers.

I may here quote an opinion on this point, of a great man, not long passed away from among us, as far as his bodily presence is concerned, but whose name will never be forgotten wherever the English language is spoken,—I mean Lord Macaulay,—the history of whose life has lately

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been brought before us, with rare felicity, so as to cause us to add to our previous admiration of the historian and statesman a warmer feeling towards the man.

Lord Macaulay asks, "What is meant by the complaint that there is no individuality now? Genius takes its course, as it always did. Bolder invention was never known in science than in our time. The steamship, the steam-carriage, the electric telegraph, the gaslights, the new military engines, are instances." All these things "indicate rather a restless impatience of the beaten paths, than a stupid determination to plod on in those paths. So great is the taste for oddity, that some who have no recommendation but oddity, hold a high place in vulgar estimation."

Now, if it be true that we have fallen on an age of great scientific progress, it will not do for the architect to ignore hard facts, and to be for ever yearning for an impossible resuscitation of the past. In the imitative art of painting, the artist may ignore the present if he will; he may people his canvasses with gods and goddesses; he may breathe the air of Arcadia or Elysium, and only return occasionally to the base sublunary ideas of modern life, when he needs to find a patron, or to examine his banker's book. To an architect, such pure abstractions are impossible. He must be of his own time, and has no claim to existence unless he ministers to its requirements. Men do not build in order to look at their work, but to use it. Happy is he who can combine beauty and grace with perfect fitness, for he is the true architect, and in him art and science have met together.

Students of art who intend to become practical architects should bear this well in mind, and should not allow themselves to be unduly discouraged by the gloomy prophecies of failure, in which too many indulge with a facility which they almost appear to think stamps them at once as authorities. The past is ransacked, and its styles of architecture are paraded before us. What, we are asked, is your style? Why do you not give us something new? The question to some extent answers itself. Men worked on formerly in ignorance of the progress of others. Now, originality is hindered by the affluence of knowledge. The results of long and painful experience are secured with one grasp, and our historical knowledge is the main hindrance to possessing a style of our own.

Originality in architecture is not only limited by such considerations as I have endeavoured to explain in a previous lecture, but it is also now, as it has ever been, the divine attribute of genius. Architecture, as an "art of utility," cannot depend on the rare and uncertain appearance of original genius, however gladly she will ever welcome its advent. She has to take note of the accumulated knowledge of centuries, to strive after beauty while insisting on utility, and to guide her proceedings always with common sense. Unfortunately for architecture it is an art which cannot be indulged in without a more or less considerable expenditure, and with the increasing price of modern labour, it must, in the highest forms, be out of reach of the multitude. And bear in mind that the great principle of modern social progress is care for the multitude; and their interests are now rightly placed everywhere in the foreground. There may be, and no doubt will be, as fine works of architecture hereafter, as have ever existed in the past, but they may be obscured by the vast numbers of lesser things which are brought into existence to supply the wants of the masses.

We often lament, and, unfortunately, with good cause, that whereas the workman of old took a pride in his work, and showed an individuality in it, we look too often in vain for the evidence of such principles in modern work. Some ascribe this result to the introduction of machinery, but this is probably to confuse cause with effect. It is the *demand for labour* which has raised its value, and has brought upon us the necessity for economising it, as far as possible, by machinery and labour-saving inventions. The world has obeyed the Divine command to increase and multiply, and the question has thus been raised,—Is half the population to be without shelter, in order that labour may be lavished on the remainder? Modern civilisation gives a clear answer to this question, and the architect, as the servant of the latter, must strive to bring his art within the scope of her behests.

We have seen that in Mediæval times, the hewers of wood and the drawers of water were housed in the roughest manner, and this was also the case with the common people and the slaves in Rome and Greece. We have too much reason to be dissatisfied ourselves on this point, but much is now doing to remove the reproach, and there is consolation in the thought that when evils are admitted by the public voice, their cure or mitigation, in this country, is seldom far distant. When this has been done; when our people have become well lodged; when education has begun to gather in its fruits of temperance, self-respect, and culture; I cannot but hope that art will have something to show for its share in the good work, and something to contribute to its further progress. If for us architects the days of castle building be over, we may find a work, less showy perhaps, but as really noble in educating the taste of an emancipated people.

Let us now consider, for a few moments, the peculiar requirements of modern cities, as they present themselves to the architect.

Any large assemblage of people in one place must, of course, give rise to difficulties as regards the provision of healthy dwellings. A cottage, standing in its own grounds, may long be deficient in many things, without causing more than a passing inconvenience. Soon other cottages are erected near it; these press one upon the other, till waste spaces are covered and houses touch. The ditches are defiled, springs are polluted, verdure is banished, and the air is thick with smoke. The former country hamlet is now the centre of a great town, the only home of its poor, and only too often the hotbed of crime and vice. What can architecture do in such a case, but wait and plead, until the public sense of responsibility is roused to insist on the necessity of wholesome habitations for all classes? The architect may then point out the advantages that may accrue to the entire community by making arrangements which, while removing reproach, may add interest, convenience, and beauty, to our cities.

But it is with other classes of buildings than the houses of the poor that we have to deal. While these need not be ugly, they cannot, of course, add much to the architectural ornaments of a great town. Such ornaments must be looked for in the public buildings, the banks, mercantile offices, and the dwellings of the wealthier inhabitants. On all public improvements it has long been admitted that the public has a right to speak. But though the principle has been admitted, the application of it has hitherto been far from complete; and even in utilitarian matters, it is to be feared that some terrible catastrophe may one day startle the public mind by the revelation of deficiencies in our legislation, as applied to the buildings in large towns.

Take, for example, the case of theatres, and other places of public assembly. It was but lately that hundreds of victims perished miserably at the Brooklyn Theatre, New York; and there are theatres in London which I never enter without anxiety, or quit without a feeling of relief. We have no public officer who can insist on the sufficiency of entrances and exits, proper width of passages, isolation from adjoining houses, and such matters. Stairs in new buildings must indeed be of incombustible materials; but they are too often narrow, ill-constructed, badly planned, and inconvenient, and the public has no choice but to submit. The evil is not only great but growing, for, in these respects, it is often our newest structures which are the greatest offenders.

Of course, when anything is wrong, people are apt to cry out on the architect, as if he were responsible, but this is not right. Wherever rents are high, as in London, land is dear, and the temptation to a lessee to recoup himself in every legal way, is irresistible. A difference of a yard in the width of a passage may give an extra row of seats, worth hundreds a year to the manager; and he knows that the public, ever thoughtless, when its amusement is concerned, will rush to a theatre, heedless of its hidden perils. I have mentioned theatres, not because they are the only buildings for which public control is needed, but because they are among the most obvious specimens of the class, which includes concert and lecture-rooms, churches, and all places where the public assembles in large numbers.

We have suffered, as to these matters, in London, for our vastness, which has always hindered the establishment of a central municipal authority, charged with an effectual control of architectural questions; and as there is a daily-increasing reluctance, on the part of the Imperial Government, to deal with metropolitan questions, Londoners are constantly falling between two stools, and have less power over their affairs than is possessed by the inhabitants of other English towns of far less importance. The Metropolitan Board of Works, although a modern creation, has shown itself alive to such responsibilities as the jealousies of public policy have allowed to be placed upon it, but it has suffered repeated checks from such causes. A well-meant attempt was made by this body, some time back, to obtain from Parliament such powers of supervision over theatres and public buildings as I have alluded to; to be used by the Board only in the interest of the public. Unfortunately, the application was refused; but it is quite clear to me, that the question must be faced, and that soon, as one of serious importance.

In the meantime, architects are not only bound to try to arouse the public interest in these matters, but their own responsibilities are intimately concerned in their satisfactory solution. Their profession is one of the most anxious, and I may add, thankless, in existence. If there is anything wrong in our houses, it is always the architect who is accused, and no one thinks, or cares to inquire, how far he has been controlled or overruled. Indeed, he is made answerable in thousands of cases, as to which no architect, worthy of the name, has ever been engaged, and in some of our most important works, public bodies appear to wish to deliberately ostracise the best men, by insisting on the lottery of competition.

Now, I yield to none in affirming that an architect must bear all fair responsibility; but if it be made clear that our public regulations are insufficient to secure good building, and even to provide for the safety of the public, it is evident that in this free country, in which the popular voice is all powerful, the real responsibility must rest with the public itself.

Architects are constantly publicly instructed, with emphasis, by self-constituted advisers, as to evils in our buildings, some of which are imaginary, while of others they are well aware, and remedies are presented with all the confidence natural to irresponsible critics. But it is forgotten that such remedies would frequently bring inconveniences of their own, and that they are generally costly, and would, therefore, raise rents. Houses in London are, moreover, mostly built on land which is leased for a term of years, which, I am sorry to notice, is becoming more and more restricted in some recent leases. Doctrines of tenant rights have not reached the metropolis; but it is idle, in my opinion, to hope for substantial improvement in our domestic architecture as long as men are called upon to build for the ultimate advantage of others. It is scarcely too much to say that in solidity of construction, and in provisions for safety in our places of public resort, we are behind most, if not all, of our European contemporaries. These are matters which are most important to the architect; for, without good and solid construction, architecture is a sham.

We know how careful the Romans were as to the corridors and exits of their theatres; and their work will remain, as a guide to future ages, after many of the flimsy structures of to-day have totally vanished. If the architect be, as I have said, greatly interested in these questions, they are to the public of vital moment, and it is for the public to deal with them through its chosen representatives. It is useless for an architect to provide exits in his plans, which are afterwards built up and disused because each doorway is a source of expense to the management, and there is no encouragement to design good houses as long as people prefer low rents to healthy homes.

In country places, where buildings are, perhaps, placed in spacious parks, isolated from all contact with others, it may, doubtless, be contended that any regulations in the interest of the public are uncalled for, and would be an unnecessary interference with individual liberty; but in towns the case is different. Here a man cannot live only for himself; he must so enjoy his own rights as not to injure his neighbour's. The principle of building regulations has long been conceded, and it only remains to determine their extent and application. Such regulations are, indeed, essential to the well-being of the community in modern cities.

Another important point in our civic architecture is the selection of materials, as bearing on both the artistic and the utilitarian side of our art. We have most of us admired the timber houses, so much in favour with Mediæval archi-

tects, and some are doubtless found to regret their disuse, and to declaim against any prohibition of such a manner of construction in our modern towns.

A careful study of old timber-houses will show us that their beauty depends on the sensible application of true principles of construction and decoration, designed with a careful recognition of the essential characteristics of the material employed. The forms of all corbels, windows, and roofs are such as are suitable for wooden construction, and for no other. But we do not find that wood was chosen by our ancestors, except from necessity. It was at hand in the great forests and woods of a sparsely populated country; it could be worked with simple tools, and quickly erected. Carriage was easy for it, as compared with more solid and weighty materials: it presented, in fact, the cheapest and easiest method of housebuilding; it was consequently generally employed, and the old builders brought to bear upon its construction all their skill, as well as their knowledge of art, for its ornamentation.

The crowding of hundreds and thousands of houses into cities, such as London, could not be foreseen; but I have shown, in one of my former lectures, how soon the civic authorities became aware of the danger of wooden buildings, and have described the simple remedies which they prescribed.

In modern architecture, wood bears a more subordinate place, and in so treating it we do but follow the same principles of common sense which guided our forefathers. They built chiefly in wood, because they had practically no choice but to do so. We have materials of all kinds brought to our doors, and if we attempted to employ wooden construction, as they did, the material would soon reach a famine price, and ultimately fail us. Thus, while we may not copy their practice, we may well be guided by similar principles, and may study, in a similar spirit, the qualities of the materials we employ, with a view to that rational application of ornament, which has ever distinguished good art from bad.

Having already spoken to you on the question of materials, and their effects on originality of architectural design, I will not dwell again upon that part of the subject. As, however, I have referred to danger from fire, I may, perhaps, be allowed to say a word as to the use of incombustible materials in our dwellings and public edifices. We do not need to be reminded how terrible an enemy fire is to architecture, and to human life. We know what it has done in former times to London, and the misfortunes of Chicago and Boston are recent. Hardly one of our theatres has escaped, and few even of our cathedrals have not been injured or threatened. It is, therefore, unnecessary to say that architects are bound to study this question, which is far from simple. Where a great body of fire exists, as in a warehouse stored with inflammable substances, such materials for supporting fire bear so large a proportion to the constructional portions of the building, that the latter are simply overwhelmed, and wood, stone, iron, marble, and brick, are involved in one common ruin. This has led some persons to think that a fireproof building is impossible, and, perhaps, in the strictest sense, it is. Not so, however, practically, in the vast majority of cases, with which architects have to deal. Because iron and stone have yielded, when exposed to intense heat, it does not follow that they may not be employed with advantage when all the circumstances of each case have been fully considered, and I cannot subscribe to the doctrine, than in public buildings, it is better that the stairs should be made of wood, which will burn, rather than of stone, which will not.

There is and should be no difficulty, at any rate, in so constructing our domestic architecture, that the existence in our houses of any large body of flame sufficient to cause danger to materials not in themselves capable of ignition, should be a physical impossibility. Unfortunately, this is seldom or never done, from causes to which I have already adverted. Houses are built to last for a term of ninety-nine, or even eighty years, and their builders prefer to pay premiums to fire offices rather than to invest additional capital in their buildings, so as to render them permanently safe from danger by fire.

The application of incombustible materials to ordinary buildings is still in a backward state in England, more so by far than it is in France, for example; and with reference to theatres, it has scarcely been seriously attempted. In these buildings the stage and its appurtenances must probably be always, more or less, inflammable, although chemistry may help us in this respect; but, as regards the auditorium, no difficulty exists which is not to be surmounted by any skilful architect, and a dangerous fire in this portion of the building ought to be an impossibility.

It is, indeed, even now panic, rather than actual fire, that constitutes the most terrible danger, in case of accident; and if the audience were conscious that the construction was, as it should be, if they saw wide corridors and ample staircases, *of materials which will not burn*, we should never again have to deplore such a calamity as the American catastrophe, already dverted to.

With the theatres, as many are now, it is quite right for the Lord Chamberlain to regulate the number of chairs, and to insist, whenever he can, on any precautions against the spread of fire which his experience may suggest; but the evil is hardly touched by such palliatives. We require regulations as to plan and construction at the outset. It is not enough to seek to improve our dangerous structures; but the construction of similar buildings should be made illegal. I leave this subject, as I began, by saying that the matter is one, not only or chiefly of architectural importance, but of public interest, to be dealt with by our rulers, as soon as they have come to be in earnest on such questions.

Passing from the class of considerations which determine the choice of materials, on constructional and utilitarian grounds, we may briefly allude to that of colour, more especially as applied externally. And here we confront the great enemy of architecture in our large English towns: I mean smoke, and its attendant evils, which destroys many of our materials, and injures the effect of all of them; which often renders abortive the best studied designs of chiaroscuro, and too often reduces our buildings to a dull monotony of depressing dirtiness.

And this is not all, for dirt, more than climate, affects our designs, and we cannot indulge with any freedom in the balconies, loggias, and recesses, common under more favourable conditions. Is it too much to hope that science may some day come to our aid, and deal with private chimneys in the same way as it has done with the greater offenders belonging to manufactories, steamers, and public establishments?

It was, I believe, to the energy of Lord Palmeraton, relegated, for a time, to the supposed uncongenial duties of the Home Office, that the latter vast improvement of the smoke question was due; and if so, it may serve as an illustration of the old truth, always recognised by really great men, that "whatever is worth doing, is worth doing well."

But whatever improvements science may have in store for us in the future, we must deal as well as we can with the existing state of things, and if we are able to introduce the joys of colour into our streets, we may well be glad to do so. It is very difficult, however, to effect this satisfactorily. Effects of colour, if they appear to spring naturally, and without effort, from the materials employed, will be satisfactory, always supposing that such materials are appropriate to the purpose for which they are used, and in harmony with the main lines of the architecture. Otherwise, external colour is too often vulgar and offensive, and seems to serve no further purpose than to display an affectation and straining after illegitimate effect, which is fatal to repose, and to all principles of true art.

The first æsthetic necessity of architecture is that of apparent solidity and permanence; we must not, therefore, in our climate, indulge in the external use of coloured marbles, which only serve to indicate incipient decay. Glazed tiles and pottery have not as yet been very successfully employed on any large scale, and the necessary smallness of their parts will always render them more suitable for mere prettiness, than for dignity of treatment, such as we look for in important buildings. Polished granite is free from this difficulty, and if its costliness could be got over, might serve us admirably in our smoky and dirty streets. The use of such a material would necessarily modify our architecture, and compel greater simplicity in details and mouldings, which would be far from an unmixed evil.

The application of colour, internally, has been practised in all ages. In the majority of cases of domestic architecture, it is less a question for the architect than for the individual taste of the owner. In public buildings, however, it is unquestionable that coloured decoration is one of the most powerful aids to effect at the disposal of the architect.

We all remember recent discussions as to the decoration of St. Paul's, and cannot doubt that Wren would not be contented if he could see his *chef-d'œuvre* in its present unfinished condition. No progress appears to have been made in this matter, though we were lately told by a member of the committee that no less than 40,000*l.* had been collected for purposes as yet unfulfilled. I am not going to plunge with you into the mazes of this thorny question; but it is, I think, impossible to compare the state of St. Peter's, at Rome, with our own St. Paul's, and then to rest contented with a do-nothing policy in respect to the latter. Some critics have affected to speak contemptuously of St. Paul's, so that it might seem that it is of little consequence whether anything be done or left undone. I may, perhaps, be allowed to remind such persons that it is not very long ago that the word "Gothic" was only used contemptuously, so that Horace Walpole, who speaks of his head as being "filled with Gothic story," nevertheless complains that no one agrees with him, and laments that "the general disuse of Gothic architecture, and the decay and alterations so frequently made in churches, give prints a chance of being *the sole preservatives of that style*." Fashions change, and we, in these later days, have become so accustomed to hear the rival word, "Renaissance," applied as a term of reproach, that it is necessary to remember that great reputations, whether of men or of buildings, are, for the most part, based upon solid claims.

I have before quoted the views of Lord Macaulay on the question of originality, and you may, perhaps, feel as interested as I was on learning the effect produced on him by the first sight of St. Peter's at Rome. He had, of course, read and heard a great deal about it previously, and was prepared for much—a state of mind often the prelude of disappointment. He writes in his diary of 1838:—"Walked straight from the hotel door to St. Peter's. I was so much excited by the expectation of what I was to see, that I could notice nothing else. I was quite nervous. The colonnade in front is very well—very, very noble—yet it disappointed me, and would have done so had it been the portico of Paradise. In I went, and I was, for a moment, fairly stunned by the magnificence and harmony of the interior. I never in my life saw, and never, I suppose, shall again see, anything so astonishingly beautiful. I really could have cried with pleasure. I rambled about for half an hour or more, paying little or no attention to details, but enjoying the effect of the sublime whole."

Such was Macaulay's first judgment on St. Peter's, a judgment which subsequent visits only confirmed. I notice his opinion, not as coming from one who had made art his special study, still less as the verdict of a professional art critic who is almost bound to prove the necessity of his existence, as well as his superiority, by finding fault. Macaulay was neither of these, but he brought to the question an unprejudiced and widely-cultured mind, which gives weight to his opinions, and which may, perhaps, help some of us to rise superior to the narrowness too often engendered by fashion in art. Referring to the coloured decoration, and particularly to the mosaics which abound in St. Peter's, he says, after another visit:—"The best portraits of the great men of England, reproduced in the same material, beginning with Holbein's Wolsey, and More, and coming down to Lawrence's Wellington and Canning, would be worthy decorations to the new Houses of Parliament. I should like to see also the walls of St. Paul's incrusted with porphyry and verd-antique, and the ceiling and dome glittering with mosaics and gold."

There was a time when any suggestions for the artistic adornment of the Palace of the Legislature fell on sympathetic ears, and the care of such matters was entrusted to a Royal Commission, on which the Consort of the sovereign deigned to serve, and of which his was the moving spirit. Now, this is one of the many things which serve to remind us of the irreparable nature of the public loss, and the evidences of the arrested schemes of artistic decoration are eloquent of the Prince, who gave up his blameless life all too soon for the public good. Macaulay's suggestion stands, however, and a day may yet come for its consideration. He went again and again to St. Peter's, and at last writes: "To St. Peter's for the last time, and rambled about it quite sadly. I could not have believed that it would have pained me so much

to part from stone and mortar." With this quotation, I will leave the consideration of the effects of colour on internal architecture, as a question which, as I have already said, has been generally decided in the affirmative.

When we have settled the arrangement of our towns, and decided on appropriate materials, we have yet to consider the probable future of our domestic architecture, and we shall find here much to occupy our attention. With regard to the houses of the rich, there has certainly arisen improvement, as far as external effect is concerned, though their internal finishings lack, too often, both the solidity and refinement of their predecessors, of so recent a time even as that, for example, of the Brothers Adams. But there is no doubt that there is a disposition to improve; and without entering into details of design, on which much difference of opinion will always exist, we may all rejoice to see stucco making way for stone, and even for granite.

It is natural, under the circumstances which I have attempted to describe, that there should be great differences of opinion on matters of taste. Taste is, too often, a mere matter of fashion, and however unreasonable a fashion may be, no arguments, and no ridicule, will affect it for a time. Afterwards there comes, indeed, the inevitable recoil, and then the sober conclusions of good sense resume their sway. So it is with architecture: we have had no lack of eloquent denunciation of the works of Michelangelo, of Wren, of Inigo Jones, and other illustrious artists, disposed of under the title of the "pestilent" Renaissance. On the other hand, we heard but recently a war-cry of defiance from a well-known member of Parliament, belonging to the present Government, declaring that if there be anything to complain of in the present position of our architecture, it is the direct result of the great "Gothic revival" of our time.

Without necessarily casting in our lot with extreme theorists, we may, I think, fairly note with satisfaction the increase of interest in architectural questions, and the spirit of improvement, particularly in our large towns, which is generally apparent. It seems, indeed, incredible that any critics who have eyes to see the changes that are going on around us, and who remember the days when streets like Gower-street were possible, should do their best to dishearten improvers by their pessimist declarations.

It appears to be a palpable ignoring of obvious facts to deny that our public and commercial buildings, and the houses of the wealthy, are now designed with a care and attention to architectural beauty, which is a healthy sign of progress.

To the great and difficult problem of providing houses for the necessitous population, I have alluded in a former lecture. It is a question surrounded with perplexities, not the least of which will be to secure the application of the improved dwellings, when built, to the purpose for which they have been erected, so that they may be used by the class for which they are intended. Under our present circumstances, it is not for the artisans, but rather for a class just above them in the social scale, that our sympathies are chiefly due. Our artisans have had years of high wages and increasing prosperity, and have prospered accordingly, while our clerks and lower middle class, particularly those with fixed incomes, have had to encounter, as best they might, the effects of rising markets and practically diminished resources. Now that the provision of healthy houses for the poor is beginning to be recognised as a public obligation, I am not without hope that the principle of co-operation, not in any eleemosynary sense, may be applied to the houses of the middle class.

It is this principle, which, in our clubs, gives to the member who enjoys a mere pittance of income, the comforts and luxuries which only the possessor of thousands can command in his own house. It is the same principle which enables the poor man to travel as safely and rapidly as the millionaire; it is the principle which has brought to the houses of all of us comforts for which kings and princes have formerly sighed in vain. But it has as yet been very partially applied among us to dwellings.

It is true, we have a few expensive "mansions," where we may live in "flats"; but there is so strong a feeling amongst English people in favour of having a house of their own, and the requirements of family life, *in health and disease* are so various with us, that it is doubtful whether the flat system be capable of very extensive development in this country. None the less is it evident that the separate house system is, of necessity, wasteful and expensive. Might it not, therefore, be possible to remedy these evils and yet retain the separate house principle?—to establish economy of service on the principle of co-operation, while retaining the substantial advantages of the habits of life, to which we are accustomed, and to depart from which would be distasteful to most Englishmen? If we are to seek the advantages of living, to a certain extent, in common, must we lose the privacy we so much value? and is it necessary that we should take up our abode in barracks, piled up perhaps to a tenth or twelfth story?

It has often struck me, that in laying out our towns, provision might be made for correcting some of the objections I have referred to. Take the case of squares, for example. Here we have rows of houses surrounding a piece of land, which is planted and turfed, and is of considerable value. Why should it be wasted? Without withdrawing it from the nursemaids and children, who now principally use it, not very freely, might it not be possible, so to utilise the subsoil, as to provide for the houses around the square most, if not all, of the advantages which the flat system proposes to give?

I have placed before you an illustration of my meaning in a plan for such a square as I have hinted at. In this sketch the principle only is embodied, as the details will admit of much variation.

I have supposed a square of about seventy houses, inhabited by middle-class families. Each house would be complete, as at present, in respect of the sitting and bed-rooms. The kitchen and offices, common to all, are placed beneath the garden in the square, which, with the exception of small space in the centre, of about 25 ft. long and 10 ft. wide, would be turfed or planted in the usual way. The kitchen is in the open central space. It is covered with a skylight, and has abundant provision for ventilation. It would be invisible from the houses, as it would be surrounded by a glazed conservatory or greenhouse.

With the exception of the small space occupied by the kitchen skylight and the surrounding conservatory, the square would be turfed and planted as at present, with openings in it occasionally, to light the offices below. The offices would only occupy a small portion of the subsoil, and above them there would be sufficient thickness of earth to support vegetation. An instance of this arrangement exists in the gardens of Parliament-square, Westminster, close to the Houses of Parliament, under which the Metropolitan District Railway now passes. These gardens are, as regards flowers, among the most brilliant in London during the proper season.

The square would not have equal sides, but would be oblong in form, and the houses at the narrow ends of it would be built in the garden, with which they would communicate by means of terraces. By an arrangement of the levels, such terraces might be raised sufficiently to allow of the construction beneath them of rooms, built above ground, and with windows. These would serve as living rooms for such of the servants of the establishment as might be required to live on the spot.

In the conservatory, the waste heat from the kitchen would be utilised, plants and flowers would be kept alive in it, and it might also serve as a winter-garden, for exercise and recreation. The kitchen is surrounded by the other offices, radiating from the centre, and passages lead outwards in four directions to the four sides of the square. These passages pass under the roads, and establish a mode of optional communication with the basement of each house. Such communication might take place by means of a door, to be locked at night, like any other outer door, or there might be a window, with a turnstile through which food could be delivered. There would be a call-bell and speaking-tube from each house to the office of the controller, or officer in charge, of the kitchen establishment.

Beneath the underground passages there would be subways, in which all drains and pipes would be placed, in such a manner as to render access to them easy in case of need. Any required service of steam, hot and cold water, gas, or hydraulic power, would be supplied to the houses from the central establishment, much more directly and economically than by separate arrangements. Each residence might in this way possess a lift without needing special or expensive machinery. Cooking would probably be carried on chiefly with gas, and the products of combustion from all stoves and fireplaces in the offices, would be carried off by shafts, built as turrets at the corners of the houses at the small ends of the square, and so constructed as to consume them. These turrets would also form the boiler flues, and would be available for ventilation and for water-supply. In connexion with the latter, swimming and other baths could be provided for the two sexes, and thus promote health and useful exercise with the rising generation.

It would be the duty of the controller to receive and execute all orders, and to exercise over the whole establishment the same vigilance and economy which rule our clubs. All expenses would be booked and charged to the proper person, the bills to be paid weekly, and the cost of the establishment to be defrayed by a subscription or rate levied on the houses, as is now done for the maintenance of the square gardens, and managed by a committee of residents.

Such are the heads of a scheme which, if there is anything in it, may perhaps be worthy of discussion, and may some day be worked out in detail. It does not, of course, address itself to those who maintain large establishments and think little of economy. It does not profess to secure all the advantages of complete separation. But it is an attempt towards middle-class co-operation in defraying the great and increasing cost of living, and of building operations, in our large towns. It suggests an effort towards combining privacy and comfort, with the economical and other advantages of co-operation, to a greater extent than appears possible in huge tower-like buildings, laid out in flats, approached by a common staircase. The danger from fire in these great blocks is a contingency not to be thought of without a shudder, while the height is extravagant, and the inmates, particularly the young, the old, and the infirm, are dependent on mechanical contrivances, which may fail them in their hour of need.

In the construction of the houses round the square, there would be much saving of cost, and, consequently, of rent; for there would be no need of separate kitchens, sculleries, &c., with their wasteful fireplaces, in each house. All that would be wanted would be a small reception kitchen, in which food could be kept hot, and where any simple cooking could be carried on. It would not, therefore, be necessary to extend the houses as far backwards as is now done to provide space for the kitchens, so that less ground would be occupied, and there would, consequently, be a saving in ground-rent, as well as in the cost of building. The coal bill would, of course, be lessened, and each house might be warmed, inexpensively, by pipes from the central establishment. The necessary domestic service would be reduced to a minimum, and a small staff of cooks would suffice, where now one to each house is required. Moreover, a better style of *cuisine* would be brought within the reach of those who, in spite of having to give increased wages, find themselves daily more helpless in this respect, so that efficiency and economy would be alike promoted.

It must be evident that our present system of separate living is extravagant, and that it would be easy for one establishment to supply the wants of a large number of separate families. If we assume the existence of seventy houses in our square, with an average number of six inmates to each house, the total of 420 persons is no more than our hotel and club managers are accustomed to cater for daily as a matter of course; and in such places the trouble and expense of providing must be much more than in the case we are considering, of a collection of quiet middle-class households.

It is not, of course, to be contended that there will not be drawbacks in all plans of co-operative living, but the problem seems to me to deserve consideration, and it is one which will, I think, press more and more to the front, under the social exigencies of our time. It is desirable, therefore, for architects to recognise the needs of their contemporaries, so as to be ready for any calls that may be made upon their ingenuity and taste. They may find their recompense in bringing their art to bear upon objects which seem at first unpromising, and they may rely upon it that no measure will be so effectual in forming and bringing out a taste for art among the people as that of improving their domestic architecture. Without such taste among the public, isolated efforts will be of little avail, for it is useless to place good things before a tribunal which does not know how to refuse the evil and choose the good.

Nor need we doubt that the real req-irements

of our countrymen are capable of being reconciled with the principles of art. Without going so far as some writers, who maintain that whatever is useful is beautiful, we may admit that architecture will never please if it be not consistent with truth and reason. To press this conclusion too far, as is done by those to whom I have alluded, would force us to condone the ugly structures with which our engineers have been, most improperly, permitted to disfigure our towns,—a conclusion which no one in this place, at any rate, can accept.

In this matter, as in those of municipal regulations, and the construction of theatres and public buildings, it is not right to condemn the agent when we should fix the responsibility on the principal. Our engineers have shown themselves masters of the science of construction, and if we now awake to complain of deformities, the fault rests not on the engineers, but on the public, who, by their representatives in Parliament, daily allow bills to pass which hand over our towns and country valleys to the tender mercies of a company, intent only on dividends. If the engineers do their duty to their employers by making their constructions as cheap, and often as ugly as possible, the public has no right to complain of the consequences of its own act, although we, as artists, must deplore the absence of such a general and cultivated taste among our rulers as would render it impossible to disfigure the land by Act of Parliament.

We cannot admit that art and beauty are to be thrust aside by a spirit of strict utilitarianism, such as that which contends, for example, that we must not call our ironclad navy ugly because "the beauty of a thing consists in its complete adaptation to the ultimate purpose in view." This defence was made, not long ago, by a distinguished naval architect, in reference to our later ironclads, than which nothing uglier has ever been contrived to float or to sink. I fear that our experience is too recent to allow us at present to admit the claim of their complete adaptation to their purpose of being perfect ships of war, and though we may sympathise with the naturally one-sided views of parental partiality, some of us may find it impossible to forget a picture we have seen within these walls, in which a distinguished artist found his best success, in delineating a recent ironclad, by concealing her details, and hiding her form, as much as he dared, by smoke and flags.

These are resources which unfortunately are not open to the architect, and we must therefore scrutinise closely any claims which render such palliatives necessary. If we are to accept the claim of usefulness, in all its fulness, it has been well pointed out that we may be expected to apply it to music, so as to call the shriek of the railway whistle beautiful, because it is well adapted to its purpose of being distinctly heard at a distance.

We know, however, as architects that, although we are bound to consider utility, utility alone is not art. The one addresses itself to the wants of our lower nature; the other appeals to the mind,—to that diviner part of us which enables us to claim the highest and noblest attributes of humanity, created in the likeness, however marred and partial, of the Most High.

We are not to be told that science is all-in-all, and imagination nothing. Material interests may powerfully affect the course of nations; but the higher feelings of conscience, sensitive to the principles of truth and justice, will ever make themselves heard in public affairs. So it is with architecture. We dare not make it a trade, but will ever claim for it the full position of a fine art. True, it must justify itself by common sense and by a proper adaptation of means to the end in view; but it must do more than this, for it must delight the mind and satisfy the yearnings of a cultured imagination.

It is reasonable and right that we should do justice to the scientific spirit of the age, which has given us the marvels of the steam-engine and the electric telegraph; but we cannot forget that man is not altered by these discoveries. His powers over nature are enlarged, his cravings for knowledge are more easily satisfied, but he is nevertheless the same.

Can he solve the great mysteries of life and death any better than when the world had just been born; or can he look forward into the future with more confidence than his forefathers of thousands of years ago? No, indeed! however much the mechanical side of our nature may have acquired, the imaginative and emotional cravings are the same as they have ever been, and among these is the love of beauty in art. What was beautiful thousands of years ago is beautiful now, and the perfection of the human form divine was first displayed by the first man.

We need not, I hope and believe, despond as to the future before us, in which mechanical ingenuity threatens, according to some, to thrust out beauty. Men will never be satisfied with stones instead of bread, and will ever appeal to art to satisfy the higher aspirations of the soul.

Architects must rise to their mission of ennobling common things, remembering that, if utility claims to be a power in their work, a refined love of beauty must be the governing principle. We cannot call that architecture which neglects the latter. It may be building or engineering, it may give us useful structures and powerful ships; but it is not architecture. We may value it as serving our wants, and possibly as promising a better future; but we refuse to it the name of art.

There is a passage in the thirteenth discourse of Sir Joshua Reynolds which refers to this subject so felicitously that I cannot do better than quote his words. After speaking of architecture, and pointing out that it does not come under the same rules as the imitative arts, he says,—"There is in architecture, as in painting, an inferior branch of art, in which the imagination appears to have no concern." Architecture "does not, however, acquire the name of a polite and liberal art from its usefulness, or administering to our wants or necessities; but from some higher principle. We are sure that in the hands of a man of genius it is capable of inspiring sentiment, and of filling the mind with great and sublime ideas."

The interest of architecture is indissolubly connected with those of its sister arts, which appeal more directly to the masses. To our painter brethren we look, more particularly in the first instance, to endow the masses with a sense of beauty. The surroundings of their daily toil are too often mean and ugly; but our picture galleries should be to them and to us havens of rest and a paradise of beauty. Here we may forget, for a while, the troubles of life, the anxieties,—well for us, if we should not say the greed,—of money-making, with its debasing associations. Here we rise into a purer atmosphere, as we contemplate the creations of genius, which have brought to thousands messages of peace, because they are based on the hopes and the affections of human nature, always and everywhere the same.

The great painter touches a chord in man's heart, which will never fail to vibrate when properly approached. The love of beautiful things may be deadened by the commonplace ugliness of the workshop or the factory; but it is a suspended animation; it is not dead, but sleepeth.

I have said that we look to the painter to pave the way for the enjoyment of architecture, for, in the case of the latter, the appeal must always be to a cultured intelligence, apart, that is, from an admiration of mere bigness, such as would class the pyramids among the architectural triumphs of the world. But we also appeal to the painter, as well as to the sculptor, to work hand-in-hand with the architect. This co-operation is, unfortunately, but too rare, from a combination of causes, into which I cannot enter at the end of my lecture, but without it we cannot hope for perfection, and for nothing less must we strive.

And now, in conclusion, let us believe that there is a place in this nineteenth century for art, and especially for architecture. We must not be impatient if each succeeding age develops new characteristics, nor must we quarrel with the stream of progress if it make to itself new channels, leaving wastes and shallows where once swept a deep and silent flood.

Rather let us be confident that we are not placed, in this our own time, to repine at our lot, and indulge in complaints that others have been better off than ourselves. Let us further be sure, that as long as the love of beauty is implanted in the human mind, it is treachery to art to declare the latter incompetent to deal with the problems of its day.

To us, as architects, such reflections are, perhaps, especially needed. We see around us, on the one side, the calm majesty of the great masterpieces of our art, which have received the admiration of ages, and are venerable, if only from the hallowing influences of time; while, on the other hand, we are jostled out of our places by the bustling energies of builders, surveyors, and engineers, careful about the immediate present, heedless of the past, and thinking little of the artistic future.

We are assailed by a multitude of teachers differing the one from the other, and agreeing only in the confidence with which each believes in himself.

Architecture is, in a sense, on its trial, and if it is to take the high place which alone it can fitly accept, it must satisfy the wants of men. It may not be for us to rear structures vying with the stately cathedral of old, expressing, in its solemn beauty, the hopes and fears of generations passed away, and speaking to us, as nothing else can speak, of the vanity of earthly grandeur. It may not be for us to crown the hills with castle-palaces, the symbols of oppression and wrong,—the stronghold of the powerful, the prison of the weak. It may be that the age of lavish architectural display is past; but are we to conclude that there is nothing left?

May not architects yet find success in bringing art to bear on the tastes and habits of millions, and so obtain consolation for the absence of the more selfish isolation of the past? Walking hand-in-hand with science; welcoming art wherever it may be found; striving to give Englishmen healthier and happier homes;—surely these are not light or unworthy objects?

If the conventional or utility-seeking quality of Architecture be sometimes urged against her title of a fine art, she may, perchance, find in it her most complete justification; for hers is not a mission of trifling, or mere pleasure, but rather one of deep and earnest sympathy with the wants, as well as with the artistic feelings, of all classes of men.

THREE PICTURE EXHIBITIONS AT PARIS.

AT no period until now, have works of art received so much well-considered attention, or attracted more eager purchasers; at the same time, it is only at present that the fear has sprung up that the greatest treasures of art, both old and modern, are getting more and more rare, the more security and confidence is felt in the prosperity of the world. As yet, however, but comparatively few *chefs-d'œuvre* of art have been absorbed by distant collectors, and for many a year yet the caprices of taste, and the inevitable changes in our affairs, will supply a sufficiently abundant crop of art treasures for the fortunate lovers of the beautiful to indulge in.

At this season of the year, when the French artists, like our own, are putting their last graceful touches to their pictures for the Salon or the Royal Academy, when the artists' benevolent societies in London are looking up their stewards for their annual dinners, here in Paris they are doing their best to increase their funds for indigent artists. With this view, the members of the Académie des Beaux Arts have lent their large room for the exhibition of about 150 of Eugène Fromentin's works,—an exhibition which is far less attractive artistically than that which we described a few weeks since at the sale of the distinguished Orientalist's pictures.

Might not our artists' benevolent societies arrange similar exhibitions, say, for a week or more, before the dinner at Willis's Rooms, obtaining each year, by loan, the works of some modern artist, and making a charge during the week for admission, by which means, without doubt, a considerable addition to the fund would be announced by the secretary at the dinner?

In no way are we so well able to form a correct opinion of the merits of an artist's work as when we see together a number of his productions, and by such exhibitions as take place here in Paris, and which we propose for London, we should in a very short time became familiar with many choice works which are now almost lost on the walls of private collectors.

On a much larger and wider scale than the Burlington Club the two well-known artistic and literary Parisian clubs, the *Cercle* of the Place Vendôme and the *Cercle* in the Rue St. Arnaud, have lately been exhibiting to their friends some exceedingly interesting modern pictures.

It is a little difficult to criticise with perfect freedom collections placed before us by hosts who would decidedly consider it somewhat rude that we should say exactly all that we think. They have done their best to entertain and instruct us, and they have done so well, and placed before us so much to admire, that very little good would come by pointing out the failures.

At the exhibition of the Place Vendôme, M. Meissonier exhibits two of his marvellously-painted panels,—one representing "Moreau and the Chief of his Staff in Reconnaissance before the Battle of Hohenlinden." Unlike most of Meissonier's pictures, the figures in this design are made subservient to the landscape, which represents the country covered with snow,—

"On Linden, when the sun was low,
All bloodless lay the untrodden snow."

And never before has snow been more successfully painted, the low tone of the ground being beautifully contrasted with the colour of the white horse relieving dark against the comparatively whiter snow; the landscape in the middle ground is as perfect as in Gerôme's famous snow scene in the Bois de Boulogne.

Meissonier's second picture, another military subject, is less attractive, and the critics complain that it is somewhat metallic in its treatment,—a fault surely natural enough, when all the figures are covered with military accoutrements, and are represented under a midday sun in the open air. It is certainly, on the whole, less satisfactory than the Hohenlinden scene, but like all the work of the great master, it leaves one in wonder how the hand can so unfalteringly obey the dictates of so learned a mind.

Gerôme's small picture of the "Turkish Woman at the Bath" looks like the work of a patient pupil of the great painter; we like better his small portrait of M. Garnier, the architect of the New Opera House.

M. Alfred de Neuville, the painter of the striking incident of the last days of the campaign of 1870, the "Last Cartridge" exhibits here an excessively interesting and rare episode of the same war, in which he has put together some twenty or thirty Prussian soldiers as prisoners in the hands of the French; the details of the picture appear so exact that, if it were possible, one would imagine that the whole scene had been photographed and reproduced by the hand of a Regnault or a Fortuny.

Robert Fleury's portrait of Madame R. F. is one of those delightful efforts of skill that men of strong affections only rarely in their lives execute.

M. de Nittis's two pictures of "Trafalgar Square" and the "National Gallery" are, to us, familiar subjects. It is somewhat singular that Tissot was supposed to have failed in his view of Trafalgar-square, but Tissot's incident of the National Gallery steps was very much more English and London-like than any portion of M. de Nittis's larger productions. They are not well thought of here; in fact, they are singularly bad.

There are the usual number of cleanly-painted and faultlessly-drawn French domestic scenes, and some charming small landscapes, rather replicas of Diaz and Jacques than actual studies from nature.

At the club in the Rue St. Arnaud, Pasini exhibits two Oriental subjects, "Cavaliers at the Door of a Mosque," and the "Estafette." The painter has rarely been more happily inspired, and some parts of his pictures are painted with a solidity and beauty which exceeds anything that he has yet achieved; especially will be remarked the upper part of a doorway in enamelled tiles, which are modelled with rare felicity, or rather with incomparable skill.

Gonzalez's "Walk on the Terrace" is an amusing work of the painter who "Fortunyises" better than any other of that numerous happy school.

Roybet sends two pictures, cavaliers of the sixteenth and seventeenth centuries, painted very much better and very much more like the cavaliers of that day, than they would have been painted by the artists of the period.

A picture of a *bric-à-brac* dealer by M. Mathey, representing him carefully examining a chiselled vase, is wonderful for its sober and truthful realism, the whole picture appearing to have been produced by the rapid work of an hour or two, although it is very much more probable that it is the laboured result of many, many days, and is certainly the work of an elaborate artist.

Most of the pictures exhibited at these two clubs will probably be again seen at the forthcoming *Salon*. The habit in Paris of exposing some of the paintings previously to the annual exhibition, is certainly preferable to our London very questionable system of inviting all sorts of people to the artists' studios a few days before the pictures "go in" to the Royal Academy.

Paris.

ORNAMENT AND COLOUR.*

It would be impossible within the limits of a lecture to give an adequate description of ornament and colour, and it is doubtful if, with our present knowledge, any thoroughly exhaustive treatise could be written. Civilised nations have perished, as well as the stems from which they sprung, without leaving any trace behind them. Tyre and Sidon, Troy and Jerusalem, Jericho and Carthage have gone, and scarcely a fragment remains. Within the present generation the sculptured records of the triumphs of Sennacherib and Tiglath-Pileser have been exposed to our gaze. We are now exploring the ruins of that fountain of our faith, Jerusalem, and have just unearthed the glories of the Temple of Diana of the Ephesians, and the tomb of Mausolus.† Our loss is perhaps equal in the utter perishing, without record and in the times of remote antiquity, of those tribes who had made some progress in civilisation, and from whose records we might possibly learn some of the beginnings of that ornament that still persists amongst us.

As psychology advances, one branch of the subject will doubtless be devoted to the effects produced on man by the contemplation of the beautiful in form and the beautiful in colour. How this contemplation aids in civilising him, what particular forms of beauty most strongly appeal to him in his various stages of development, what beautiful things have first stimulated his imitation, and what his invention? Why the different types of ornament have been persistent? Whether through their supposed talismanic virtues? through their being favoured by his gods, being emblems of his religion, or through their artistic capabilities? At present this branch of the object has been overlooked, and we make theories that are probably at variance with the truth. Where the imitation of natural forms is self-evident we cannot well go wrong, but where we are unacquainted with the type our conjectures must be vague.

The origin or type of the Runic or Keltic knots is still a subject of conjecture, and our curiosity is excited by the strange caprice of the designers of those Norman scrolls, in which a whole series of animals are threaded like the flock of geese on Baron Munchausen's fishing-line. All we can say is, that we share with the lower animals the love and appreciation of the beautiful, but that man alone can reproduce the objects of his admiration. In that primitive condition in which he dwelt in caves and used rude flint instruments, we find the bones and teeth of the animals he fed on carved with the representation of them in their living state.

Laying aside all thoughts of the why and wherefore, we may perhaps with advantage describe some of the main varieties of ornament, and try and fathom some of the principles on which the ornament of the more advanced nations has been designed and coloured.

The fountain-head of all ornament is nature. In the highest form of ornament (the representation of man and animals) we have but nature to copy; but this copying is not the servile reproduction of the individual, but the imaginative construction of the highest type from single specimens. In the composition of the single figure or the group, we are still only following the rules of nature. We are exercising our observation and judgment in selecting those attitudes which exhibit the highest grace, or those groupings in which there are found the greatest subtlety of line and the best disposition of light and shade.

Amongst all nations, from the savage upwards, there seems to be a desire to use man as the principal form for decoration, and next to him the most noticeable animals. It is easy to understand this desire, for "the only study of mankind is man." In the unlearned, at least, the eye is quicker to comprehend than the ear, and we get perhaps a more perfect, and certainly a more agreeable, notion of man's occupation and of his achievements by portraiture than by description. When the forces of nature come to be represented in the human form, the portrayal of man serves at once for instruction in his religion and for an object of worship. The believers of the two admitted monotheistic religions, the Jew and the Moslem,‡ have alone eschewed the representation of man and animals in the buildings and utensils devoted to religion. Both people were once idolators, and both were surrounded by idolatrous nations; but the Moslems are the only people who have left any large quantity of ornament behind them.

Of Jewish ornament we have none that I know of, except what is carved on the arch of Titus. The Moslems* have kept clearer of the representation of living things in their mosques than the Jews in their temples. The curtains of the tabernacle are described as woven with cherubim of cunning work, and the mercy-seat was adorned with cherubim of beaten gold. In the 25th chapter of Exodus we read "the cherubim spread out their wings on high, and covered with their wings over the mercy-seat." The golden mice of the Philistines were kept with the ark, and Hiram, the widow's son, made oxen of brass to support Solomon's brazen laver, and wrought lions, oxen, and cherubim on its borders.

It is true that some of the Moslems did adorn their walls, their garments, and their utensils with men, birds, beasts, and fishes; if I remember rightly, the Sheik at Cairo had hunting pieces in his saloon, and there are figure-pieces in the Alhambra, and figures and animals on the tile panels at Damascus, but we find that the stricter Moslems of a later date cut the throats of these depicted animals and destroyed the faces of the human beings. I am inclined to think that the portrayal of men and animals was a corruption introduced by the Persian Magians or fire-worshippers.

In Lane's translation of the "Arabian Nights," viz., in the story Noor-ed-deen and his son, and Shems-ed-deen and his daughter, this daughter is described "as decked with garments such as were worn by the ancient monarchs of Persia. Amongst them was a loose gown embroidered with red gold, presenting the forms of wild beasts and birds."

It is only amongst savages who cannot draw, and the adherents of Islam, that ornament is more than a border to figure subjects, or a filling between them. The main decoration of the Egyptian, the Assyrian, the Greek, the Roman, the Goth, and the Chinese, consists of figure pieces.

In treating of ornament in the modern acceptation of the term, viz., patterns either of arbitrary marks, or floral forms, in which living things are only subsidiary, we find that it consists of three sorts,—Mechanical, Natural, and Artificial, and the mechanical and natural are not unfrequently combined.

The Mechanical consists of straight, curved, or wavy lines, dots, circles, rings, stars, chequers, and geometrical figures of more or less complexity; the Natural, of a conventional representation of the bark of trees, scales and shells, the marking of insects, reptiles, birds, beasts, and flowers, of flowers themselves, of fruit, of leaves, of the foliage of plants and trees, of waves and the forms of water, of clouds, of fire, of rocks and mountains. The Artificial, of conventional representation of man's own works,—as of plaited, woven, and netted work, of cordage, of ribbons, laces, jewels, and standards, of pottery, of medals, of arms and armour, of tools and implements, of ships and boats, of carts and carriages, of houses and buildings, of tablets, masks, writing, and the like.

The love of beauty, the desire for adornment, and the gratification of vanity, combine in inducing man to invent when his immediate wants have been provided for; many savage tribes have had their taste so cultivated by a constant companionship with nature that their works are ornamented with a faultlessness that may vie with nature herself. The French poet, Theophile Gautier, remarked that if we found the mats, basket work, and pottery of any people possessing elegance of form, perfection of workmanship, and harmony of colour, we might safely say that these people were savages, and probably cannibals; but if these things were ugly in shape, coarse in manufacture, harsh, glaring, and discordant in colour, we might be sure they were the productions of a highly civilised race. There is, however, one certain test of ornament having been produced by a highly-civilised people, and that is, when the forms are of high type, great purity, and exquisite drawing.

Taking as the earliest specimens of ornament, that of savage tribes, we find the principles that

* By Mr. George Aitchison, B.A.; delivered to the City and Spitalfields School of Art, as previously mentioned.

† There are, it is true, some remnants of Carthage in the shape of mosaic pavements, but these scarcely differ from Roman work, and there are some remains of Sidon in the shape of glass bottles.

‡ All Christians call their religion monotheistic, but this is not allowed by Jews and Mahomedans. See Wallace's "Russia," and the "Koran," cap. 5, and *passim*.

* There are in certain ornaments of the mosques of late date animal forms introduced. In the mosque of Qaouam-el-dyn, of the eighteenth century, there are birds and human hands.

we can extract from the ornament to be the cutting up spaces into well-proportioned divisions, filling in the narrow spaces with zigzags, dots, stars, triangles, and the like, and filling the main spaces with irregular lines, dots, or markings, so as to get the effect of a uniform tint, and arranging on this ground spots, rectangular or other figures, symmetrically arranged; for we must recollect that these savages have constantly before them the bark of trees, the ribs of leaves, the spots on insects, reptiles, and flowers, and doubtless some of their first ornaments were the cast feathers of birds. The spiral is also one of the forms into which savage ornament is thrown.

Is this a direct copy from nature or from art? The fern on which some savages are said to subsist has a spiral bud, and so have certain other plants; there is the spiral of the eddy, of the serpent, of curls, of shells, besides the spiral of any substance that is rolled. On the ends of the war axes of some of the South Sea Islanders there is a rude representation of a human head, with two unmistakable eyes, whose whites are of mother-o'-pearl; if we knew that these savages or their enemies had curly beards or heads, we should pronounce the spirals to be a rude imitation of them, for it is not quite clear which way upwards they are to be seen; but in the tattooing of the heads of the New Zealanders we find almost similar spirals, and we know that this tattooing was in imitation of the bars of the mackerel.

As plaiting, twisting, netting, and the most rudimentary weaving came to be practised, the ornamental forms given to them must conform to the exigencies of the manufacture, and other ornament made by staining, scratching, or carving, either rudely imitate the manufacture, or the woven ornaments are reproduced in their woven forms. In spite of the ingenious theories that have been started as to the origin of the Grecian fret—for instance, that it was an imitation of the crystallisation of a metal in the form of the normal of a spiral, or from cutting notches out of the bamboo, and bending it at right angles—I believe it was either one of the natural ways of ornamenting woven work, or the nearest approach to the wave to be got by straight lines. The next form we get is the undulating line, the meander of the Greeks, which may have been suggested by undulation of water, by the movement of the serpent or the earthworm, but when once this has been got we have almost all the main guiding form of ornament—the straight line, the wavy line, parallel lines, zigzag lines, the square, the parallelogram, the triangle, the circle, the spiral, and the meander.

The savage had, too, seized the principle of symmetry and balance, and the wings of the butterfly or the wing-cases of the beetle were enough to teach him these, but however he learned them he practised them. I use the word balance in opposition to symmetry. For instance, in beetles' wing-cases and butterflies' wings the two opposite wings are symmetrical, not only in shape but in ornamentation; while the ornamentation of each wing is most frequently unsymmetrical, the spots or markings being irregularly placed, but leaving the eye perfectly satisfied. This is effected, where there is merely a difference in tone, by an equality of spacing, the smaller and larger spots being in the same proportion to the several spaces. Sometimes it is effected by variety and intensity of colour; but the secrets of success in nature are not easy to be solved. That which seems but a simple expedient is got by the combined influences of form, colour, shade, and texture, mostly too subtle for analysis. To go right, we must either, like the savage, have our eye saturated with the beauties of nature, and so go right by instinct, or, by loving and persistent study, worm out some of the simpler principles. As far as I know, the savage possessed all the main forms; subsequent people have only modified or combined them. There was, however, one method of variety which, I believe, was first discovered by the Moslem, but which is found in every tree or in every bush that is overgrown with creepers, viz., the superposition of one pattern over a similar or a different one beneath.

Each nation appears to have had a special preference for some kinds of trees, plants, or flowers; the Egyptian loved and probably adored the palm-tree, the lotus, and the papyrus; he used them as ornament in patterns, in borders, and singly or in bunches for his columns; the Greek loved the honeysuckle much and the acanthus a little, and did not altogether despise the vine, the ivy, the laurel, the olive, and the convolvulus; the Jew loved the pomegranate and the almond; the Assyrian, the pine-apple and the lotus; the Greco-Roman, the acanthus; the Arab, some plant or flower with curling leaves; the Indian, the mango; the Chinese, the peony; the Western mediævals, in the thirteenth century, some sort of conventional plant, with thin deeply-channeled stalks and leaves foliated into four or five divisions, with the end of each leaf raised into a blob as if it had been beaten up from behind with a round-headed hammer, and subsequently every kind of plant, leaf, or flower but in the best times the bursting bud or half-opened leaf was preferred. The Renaissance artists took both the acanthus of the Greco-Roman, and the fanciful and capricious decorations found in some of the Roman baths, and covered everything with ornaments, in which the acanthus carried or filled in the spaces between vases, cornucopias, animals, chimeras, cupids, medals, and candelabra. You must not suppose, by my naming one or two plants or flowers, that these nations loved these only, but merely that there is a preponderance of them in their works, for I believe that at least the Persians, the Indians, the Chinese, and the Japanese used most of the flowers and plants they had about them.*

THE RESPONSIBILITY OF MASTERS TO WORKMEN FOR THE NEGLIGENCE OF FELLOW-WORKMEN.

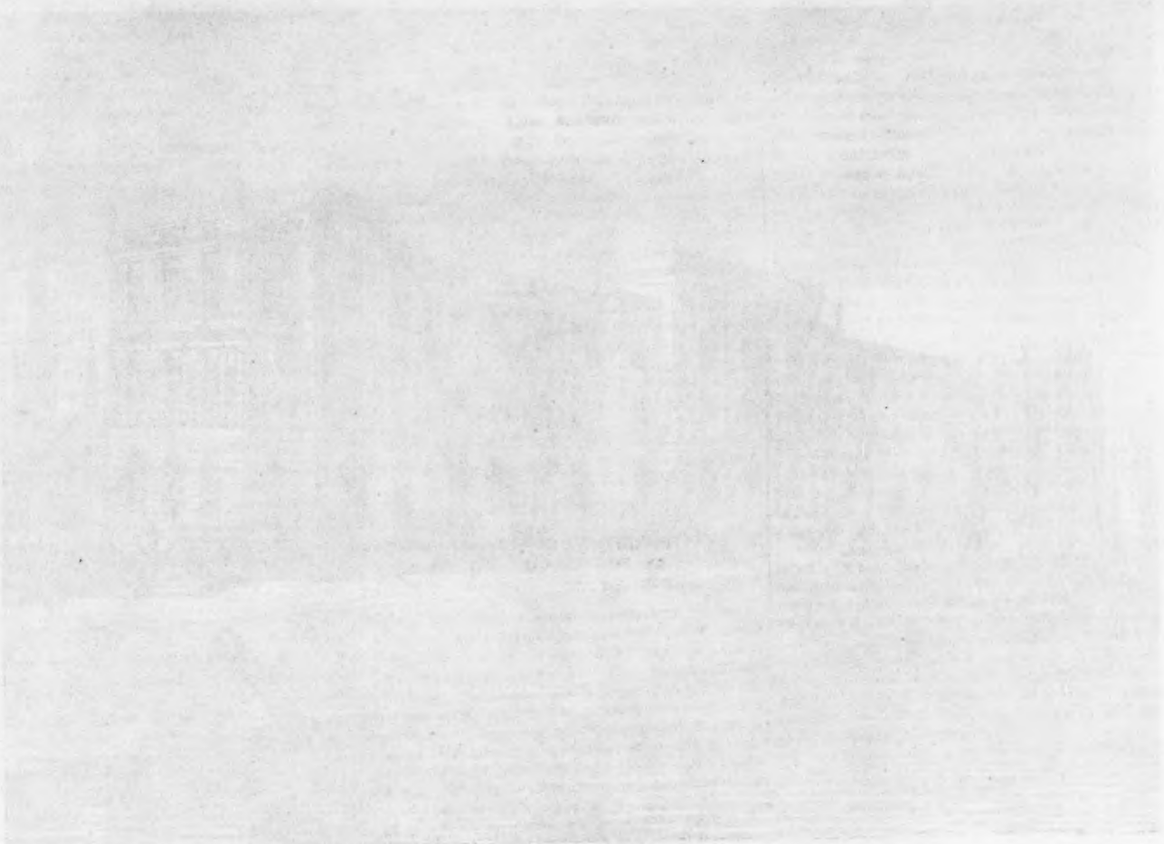
IN the first article upon the above subject we showed how the present state of the law had gradually been produced, and how that of England differs from that of Continental nations. It is necessary, before a final opinion upon the question can be given, to examine for a moment the legal reasoning upon which the English Bench has hitherto acted. It is undoubtedly good and well-settled law that the act of the servant must be considered, when done in the course of his duty, as the act of the master,—that is a principle of too universal application to admit now either of doubt or of change. It is, no doubt, one which from time to time does press with some harshness on various members of the community, especially when, as is so often the case, shareholders are mulcted in heavy damages for the acts of servants of whose doings they are utterly and completely ignorant. But, on the whole, it is for the general interests of society that this rule should prevail. Why, then, should the exception in the case of masters and fellow servants exist? We will examine the reasons, as shortly put in Hutchinson *v.* The York, Newcastle, and Berwick Railway Company (5 Exchequer Rep., 343), which contains, to all intents and purposes, the law as it has been applied to subsequent circumstances. The injured man, say the judges, must be supposed to have contracted on the terms that as between himself and his master he would run the risk "of injury from the negligence of a fellow servant." We meet at the very outset with a radically weak point. "It must be supposed," say the judges, that such an implied contract is in existence. We see no reason why such a supposition at all should be entertained; it is, as a matter of fact, a purely gratuitous assumption. If A, a master, and B, a servant, do contract on these terms, well and good; the law has nothing to do with the reasons why two persons enter into a contract so long as it is legal. But, in truth, we have no such direct agreement; workmen do not contract with their employers on any such tacit terms; they receive no higher wages as an insurance against any risk or peril they may run from the acts of fellow workmen, nor do employers seek to obtain labour at a lower rate by saying they will hold themselves liable in such cases. Both parties well know how the law now stands. Each one contracts to serve and to pay without this fact having any influence whatever on their agreement. In no single one of the several cases in which the prevailing doctrine of the supposed reasons for it have been upheld has it been proved that any contract such as the judges presume to underlie it exists at all. In some trades certain, at times singular, customs are to be found, and then the law has held that such customs form an implied part of the contract. But no such custom is allowed to be presumed unless it is first clearly proved to exist. Here, on the contrary, a supposed customary term is imported into agreements without any such custom being proved or indeed existing at all. The fallacy of the reasoning in the cases which are now law in this country is well shown by extracting the chain of argument in the above case. "Put the case of a master employing A and B, two of his servants, to drive his cattle to market; it is admitted that if by the unskilfulness of A a stranger is injured, the master is liable." That is a sufficiently sound proposition. "Not so; if A by his unskilfulness hurts himself he cannot treat it as the want of skill of his master." That, again, is equally clear and sensible. "Suppose that, by the unskilfulness of A, B, the other servant, is injured whilst they are jointly engaged in the same service, then we think B has no claim against the master. The party injured knows that the negligence is that of his fellow-servant, not of his master." Clearly this is not a logical conclusion, for B knows nothing of the conclusion to be drawn from the act of his companion, so far, at least, as to detract from the master's responsibility; and if the master is responsibile for injury done by A to a stranger, it absolutely and necessarily follows that logically and legally he should be responsible if B is injured. As we all know, one partner cannot sue another, because they possess for business purposes a common existence; but fellow-servants and masters have no such community of interests. Even such a distinguished lawyer as Lord Cairns can find no better reason, if reason it can be called, for this ruling principle than this,—that when the master has engaged competent workmen he has done all that he is bound to do; and "if persons so selected are guilty of negligence, that is not the negligence of the masters." We may certainly ask, what is there to prevent the same doctrine being applied, in the case of strangers, where the master has selected proper servants? So much for the legal reasoning of the English judges upon which the doctrine has been built; it may be of interest to supplement our criticisms by the words of an eminent Scotch judge in a case of this kind, when he alludes to the English rule, "I think the justice of the thing is exactly in the opposite direction; I have rarely come across any principle which seems less reconcilable with general legal reason." The hints which have fallen from the bench as to public convenience belong to the general question, Should the rule any longer prevail? a part of the subject with which we shall conclude in another article.

* The remainder in our next.

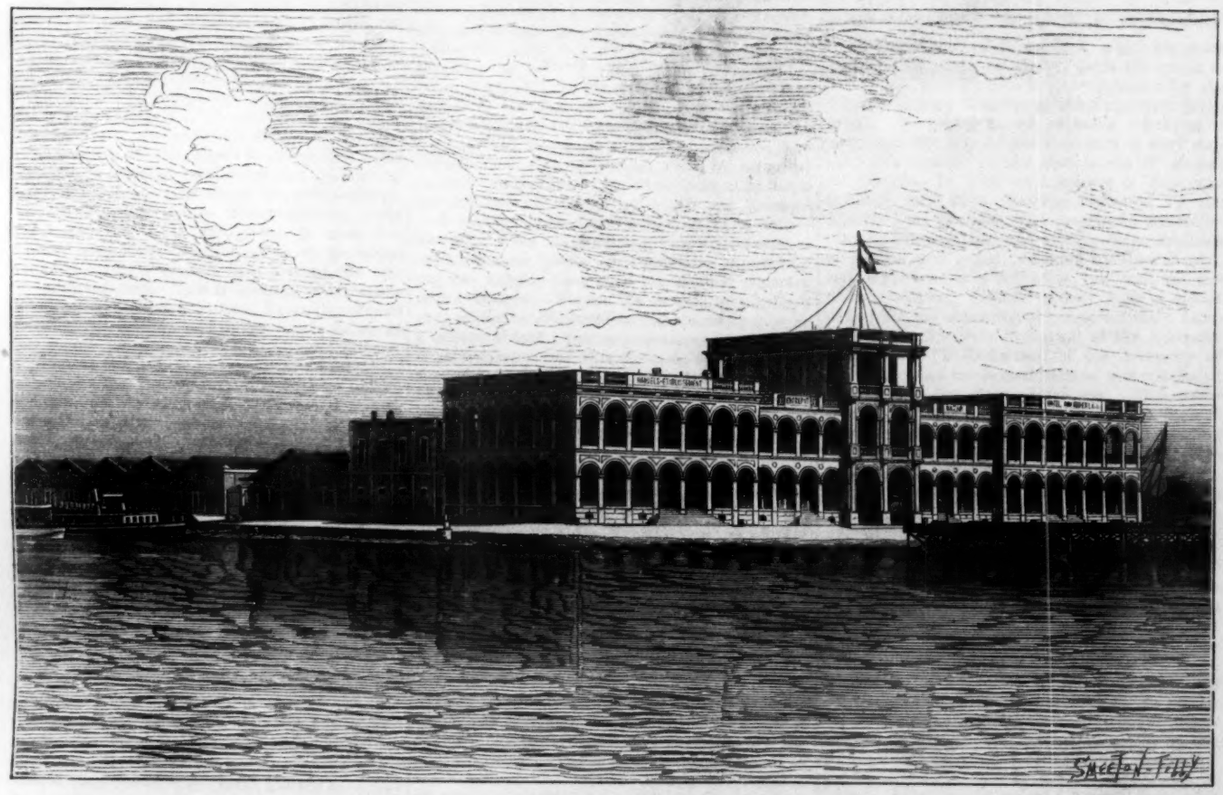
NEW ACADEMY OF ARTS, DÜSSELDORF.

THE Academy of Düsseldorf, which has some claim to European celebrity, owes its origin to the Düsseldorf Picture Gallery, founded by the Elector Johann Wilhelm of the Palatinate (born 1658). He added to the valuable collection of paintings left him by his ancestors a very considerable number of the best works of almost all schools. In 1767 an Academy of Arts was founded, and most liberally endowed by the Elector Karl Theodor, who acquired a collection of sixty-five paintings and twenty-three sketches on canvas and paper gathered by Herr Krahe, and combined this collection, as well as the already existing Picture Gallery, with a school of arts for the education of young artists. Lambert Krahe, formerly Professor of the Academy of St. Luke at Rome and of the Academy of Florence, and a celebrated painter, was appointed director of the new Academy. The same Elector also established, in 1777, the Cabinet of Antiques connected with the Gallery. Among the artists who were pupils of the Academy, and who have made their mark in the history of art, may be mentioned: A. Langer, father and son; Hess, Cornelius, K. F. Lessing, Julius Hübner, Th. Hildebrandt, C. Sohn, H. Mücke, Chr. Köhler, &c.

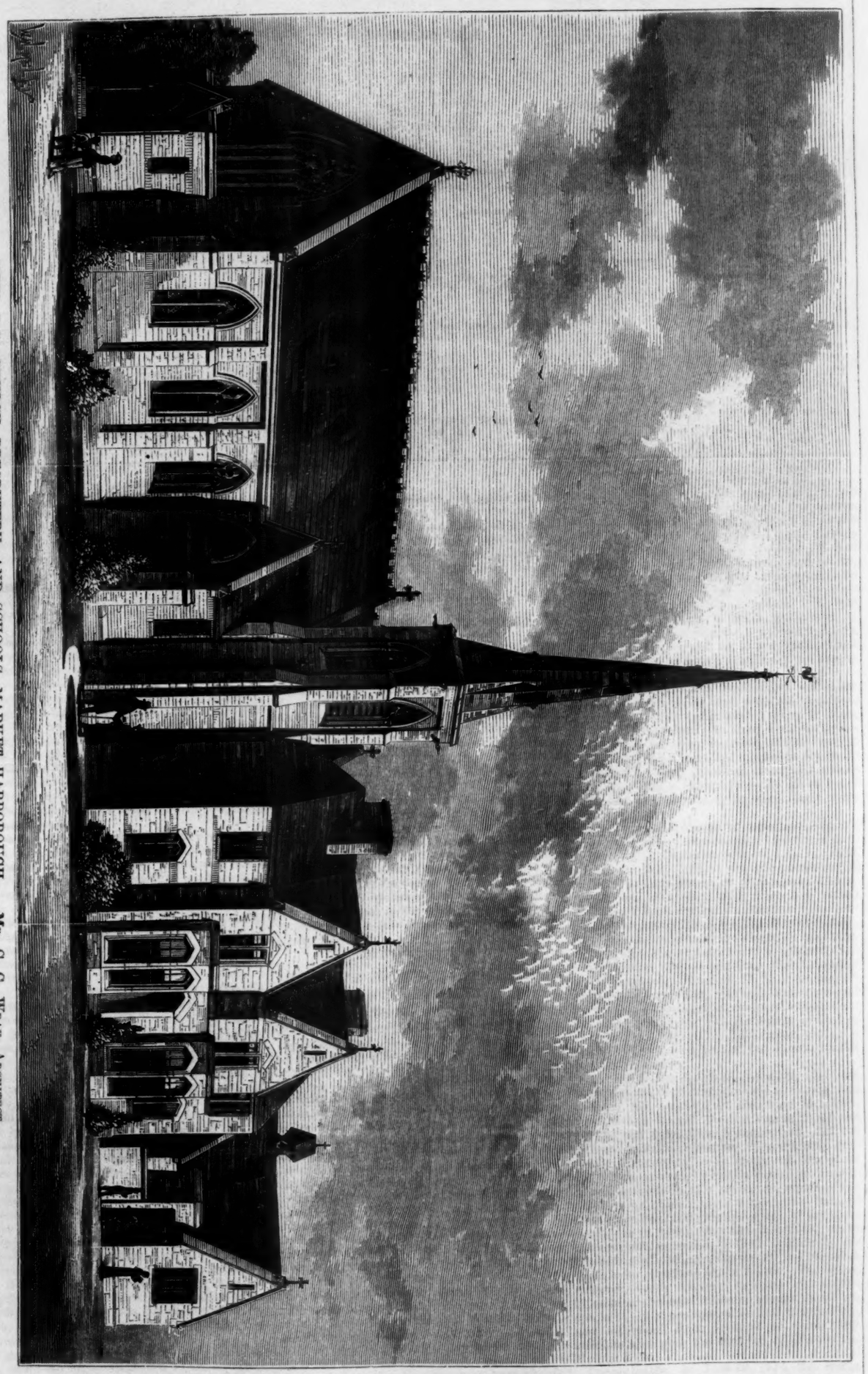
It would lead us too far were we to name all those eminent men who came from many lands to study at the Düsseldorf Academy, or to enumerate all their masterpieces. We need only record the fact that this home of the arts fell a victim to a conflagration which broke out in the night of March 20, 1872, destroying a part of the old castle, leaving only its bare walls. In consequence of this disaster, after protracted negotiations, a site at the harbour of safety on the Rhine was acquired, and an imposing new building (represented by our illustration) was projected, which is to contain lecture halls and galleries for receiving the collections of the Academy of Arts. The building is to contain eight larger studios for the professors of historical, ecclesiastical, genre, landscape, and portrait painting, the gallery of antiques, the painting class, and that of sculpture, the latter



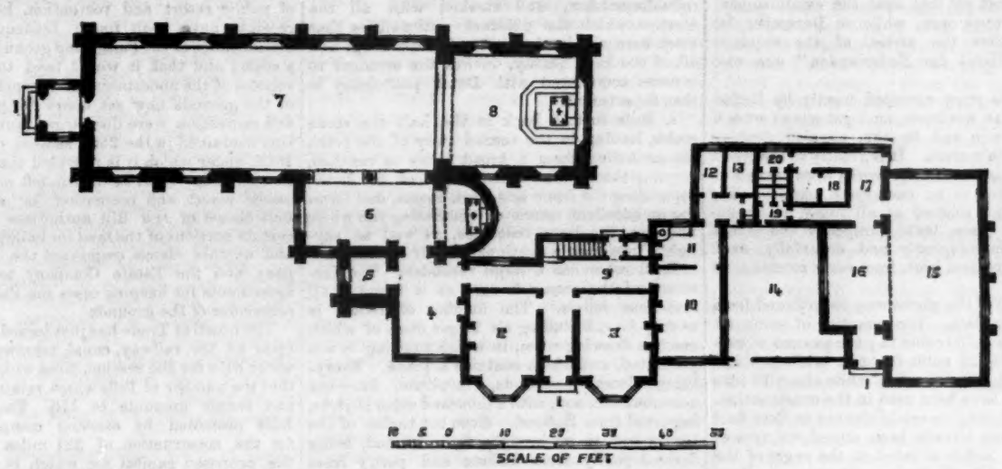
NEW ACADEMY OF ARTS, DÜSSELDORF.—HERR HERMANN RIFFART ARCHITECT.



THE DUTCH TRADING ESTABLISHMENT AT PORT SAÏD.—HEER BROUWER, ARCHITECT.



NEW (R.C.) CHURCH, PRESBYTERY, AND SCHOOLS, MARKET HARBOROUGH.—Mr. C. G. Wray, Architect.



1. Entrance.
2. Parlour.
3. Dining-room. } Presbytery.
4. Sacristy.
5. Tower.
6. Lady Chapel.
7. Church.
8. Chancel.
9. Corridor.
10. Kitchen.
11. Scullery.
12. Larder.
13. Coals.
14. Yard.
15. School-room.
16. Class-room.
17. Lobby.
18. Heating Places.
19. Girls' W.C.
20. Boys' W.C.

NEW BUILDINGS, MARKET HARBOROUGH.—*Plan.*

with clay and plaster-rooms; also studios for the teachers of engraving on copper, an elementary class, and rooms for assistant-teachers. Of studios for teachers, the following have been provided:—Four each for historical, ecclesiastical, and genre painting, five for landscape painting, one each for animal painting and a painting class, four for the students of sculpture, two for the engraving class, a large antique room, and the elementary class. The school of architecture consists of a room for its professors, with library and a lecture-hall, as well as a gallery for placing plaster casts. There are also rooms for the history of art, with room for teacher, and rooms for drawing and anatomy. For general business purposes, a conference-hall with office, a large *aula*, serving also as picture gallery, rooms for two housekeepers and servant, have been provided. Rooms have also been secured for the collection of engravings on copper, with a room for the conservator, the Ramboux collection (copies of Italian *chefs-d'œuvre*), and large galleries for the collection of plaster casts.

The new Academy buildings face towards the north, with a free view of the harbour of safety, the castle gardens, and the Rhine, and has a length of 518 ft. The principal entrance is at the east front, reached by a carriage approach from the town. The buildings are in the Renaissance style, their principal front being for the most part faced with freestone. As a horizontal termination of the windows was prescribed for the studios, it was very difficult, considering the many square-headed windows of equal size, to obtain a happy effect; but the architect has successfully overcome this difficulty by powerful divisions by freestone and pillar. The centre projections especially jut strongly forward, and are to receive in the eight niches of the second floor portrait statues of eminent artists. The balustrade is to receive statues at the corners; and over the centre parts of the building are acroteria. The principal entrance at the east is adorned with two Ionic columns with caryatides over them, supporting the entablature. A frieze with the names of eminent artists runs round the principal fronts under the windows of the first-floor. The coloured ornamental decoration of the panels between the windows in the first and second stories forms an especially rich feature, which gives expression to the character of the Academy, the decoration being grey upon grey in a darkish red brown ground between the windows of the first floor, and coloured upon a golden yellowish ground in the second story. Outside painting soon deteriorating under the influence of the atmosphere, the coloured patterns are burnt into the terra-cotta, and the experiments made to this effect promise a favourable result.

The building is being executed after the plans and under the superintendence of the architect, Hermann Riffart, and will be a handsome addition to Düsseldorf. The young architect, who was born in 1840, has already made a name for himself by his numerous creations, having gained experience by the study of the works of the East, of Italy, and France. He has obtained numerous prizes in different competitions, also the first prize for the projected new Hall of Arts of Düsseldorf,—a worthy companion to the new Academy of Arts.

NEW (R.C.) CHURCH AND SCHOOLS, MARKET HARBOROUGH.

THE accompanying engravings show the ground plan and view of the new (R.C.) Church, Presbytery, and Schools in course of erection at Market Harborough, Leicestershire. The peculiar shape of the site has necessarily influenced the plan, but the result has been a picturesque and conveniently-arranged group of buildings. The walls are faced with the excellent red bricks of the locality, with Bath stone dressings. The church has an open timber roof of handsome design. The presbytery is provided on the first floor with five bedrooms and two dressing-rooms, and with cellars on a basement floor; and the school is divided from the class-room by revolving shutters, so that the latter can be used as a stage for exhibitions, penny readings, and so on, the schoolroom being for the audience. The church and schools are heated by hot water. Mr. C. G. Wray, of London, is the architect; and Messrs. Halliday & Cave, of Oakham, are the contractors for the works.

THE DUTCH TRADING ESTABLISHMENT AT PORT SAÏD.

THE Dutch Trading Establishment at Port Saïd, founded through the liberality of his Royal Highness Prince Henry of the Netherlands, has for its aim the advancement of the commercial relations between Egypt and Holland and her colonies. The Prince was present at the formal ceremonies attending of the opening of the Suez Canal, when he at once perceived the importance of Port Saïd for the Dutch trade, and that it would become the emporium of the ports of the Mediterranean, if not immediately after the opening of the canal, at any rate at no very distant date. Moreover, should Port Saïd ever be connected by a sweet-water canal or a railway directly with Middle Egypt, it will have a large share in the export of Egyptian produce. In that case also, should Dutch manufactures be brought to Port Saïd, they would find their way there, and thus a large field would be opened up where they could profitably be introduced. We need not be surprised, therefore, that the Prince was very desirous that, whenever that time arrived, Holland should be in a position to compete in the new trading movement sure to arise.

To do this successfully, the Prince saw that the Dutch must have warehouses there in which to store their goods; that they must have wharfs, enabling them to load and unload vessels at the lowest charges; they must have a staff of reliable persons charged with the administration and supervision of those wharfs and warehouses. But the Prince had also the interests of Dutch shipping at heart. Port Saïd is the place where ships in passing the canal, whether outward or homeward bound, take in coals and water, and consequently no greater service could be rendered to that shipping than to give it an opportunity of supplying its wants. It was consequently necessary to build coal wharfs, to procure rails and trucks for a railway, lighters, and steam-tugs, as well as to construct a large reservoir with pumping machinery to supply ships with water as well as coals.

Passengers on board Dutch ships, and other travellers visiting Port Saïd, were not forgotten. To remain on board ship while coaling is going on is very unpleasant; to many a short stay on shore would be most desirable, and an hotel in the Dutch-Indian style had consequently to be established, where travellers, if only for a short time, may find a change from the life on board ship, and an opportunity to spend their spare time pleasantly.

The important charge of superintending the vast undertaking was entrusted by the Prince to Heer D. J. Brouwer, who, on July 14, 1873, started for Port Saïd, as the representative of Holland, to take possession of the ground (comprising an area of a little over two acres) which had been meanwhile purchased, to draw up the necessary plans for the different buildings, &c., and to concert the necessary measures, so that, after the approbation of the plans by the noble founder, active operations might speedily be commenced. Heer A. T. L. Rouwenhorst Mulder, civil engineer, who had been appointed by his Royal Highness to co-operate with Heer Brouwer in carrying out the works, arrived at Port Saïd on August 23, 1873, after paying a short visit, at the request of the Prince, to the docks of Marseilles.

As early as the month of December, 1873, the finished plans were presented to the Prince, and received his approval on February 15, 1874. The tenders invited for the execution of the works, and opened on February 20, did not give any favourable results. The different contractors competing, well aware of the great difficulties connected with the execution of works of such magnitude, at a place, too, where all the building and other materials had to be brought from elsewhere, and perhaps afraid of the strict conditions to which they had to submit under the contract, exceeded in their tenders by far the estimated cost, and the matter had therefore again to be submitted to the Prince. The latter, however, wisely resolved to spare no expense in making the establishment answer in all respects to the importance of such an undertaking, and authorised Heer Brouwer to exceed the estimate and give the contract to Heeren A. Meillon & Co.

Consequently, on June 20, 1874, the works were commenced. A little over two years later, on September 1, 1876, they were all but com-

pleted, so that on that date the establishment could be thrown open, while on December 1st following, after the arrival of the requisite staff, the "Hotel der Nederlanden" was also opened.

The works were executed mostly by Italian and Dalmatian workmen, amongst whom were a few Frenchmen and Greeks, as also Arabian masons and labourers. It is greatly to the credit of the contractors that the works were carried on and completed in an exemplary manner. The greatest order reigned at all times, no irregularities took place, both Europeans and Arabs working uninterruptedly and cheerfully, even during the greatest heat, from early morning till night.

The extent of the works may be gathered from the following data. The quantity of earth removed was 529,750 cubic ft.; the amount of concrete used 24,722 cubic ft.; the brickwork and masonry, 211,900 cubic ft.; while about 16 tons of ironwork have been used in the construction.

The Dutch trading establishment at Port Saïd covers, as has already been stated, an area of over 2 acres, and is situated at the angle of the Ismael and Cherif Basins. Double wharfage has thus been supplied. But besides this exceptionally favourable position, jetties have been constructed in both basins, where ships of a draught of 23 ft. may be moored. Goods may be loaded from or discharged direct on to the wharf, a double line of rails connecting the jetties with the warehouses, so that the goods remain only a very short time in the open air. Each jetty consists of a heavy wooden platform, having the form of the letter T, and supported on iron screw-piles, of which those in the outer row have a length of 40 ft. The placing of the piles required much care, in consequence of the sloping nature of the bottom. The water-supply pipes are run out on to the jetties, so that in case of a ship taking in water hose are screwed on to the ends of the pipes, and the water sent by centrifugal pumps direct on board. Removable cranes are also placed on the jetties.

The front of the principal building, round which runs a broad verandah, broken only at the entrance, faces the Ismael Basin. Standing before the principal entrance, with the back to the jetty in the basin, one has the hotel and the space to be used as a bazaar (in the event of the extension of trade at Port Saïd) on the right hand, the offices and the residence of the director on the left.

The building is 238 ft. long and 69 ft. broad, and rests on a foundation of concrete. In order to obtain a firm subsoil, the layer of clay which formed the bed of Lake Menzaleh until the present bottom of the basin was thrown upon it, was excavated to a depth of 7 ft. 3 in. The outer walls are 2 ft. thick, decreasing to 1 ft. 8 in., and the inner ones 1 ft. 8 in., decreasing to 1 ft. 4 in. This thickness was adopted in order to make use of the rough-hewn stone from Cyprus and Alexandria, and, on the other hand, because the great heat during summer at Port Saïd makes thinner walls undesirable. The mortar used consisted of well-washed sharp sand and hydraulic lime imported from France.

The first story of the principal building is 5 ft. above the ground. In consequence of the ground within the building having been excavated to a depth of 3 ft., a cellar-space extending under the whole first-floor, nearly 7 ft. high and of an area of about 11,000 square feet, has been obtained. The floor of the cellar, consisting of concrete with a layer of hydraulic cement, lies 1 ft. above high-water mark, so that the goods may be safely stored in the cellars even at the highest water-level. By openings left in the interior walls of the building, the cellars communicate with each other. The four entrances to the cellars are on a slope, facilitating very much the movements of goods, especially heavy wine-barrels.

The second story of the principal building, like the first surrounded by a verandah, contains the bedrooms and the drawing-rooms of the hotel, which extend to the residence of the director. Above the entrance is a third story of the hotel, containing four bedrooms, with a splendid view.

On entering the vestibule of the hotel, there is on the right the dining-room, which accommodates 100 persons, while to the left are the reading, billiard, and smoking-rooms, where the principal journals may be found. The furniture of these rooms is plain, but comfortable; airy cane chairs, marble-tables and floors. The rooms are well ventilated; they are also provided with fireplaces, a luxury unknown in that country, but very welcome during the cold season. A refreshment-bar, well stocked with all the niceties which the different nationalities that meet here are in the habit of consuming, and all of the best quality, invites the stranger to become acquainted with Dutch proficiency in that department.

A little further back in the hall are stone stairs, leading to the second story of the hotel. On ascending them a broad lobby is reached, running through the whole length of the hotel, separating the front and back rooms, and forming an excellent means of ventilating the whole building, the large balconies, as well as sky-lights, providing a continual supply of fresh air.

Each room has a large verandah. The furniture of the rooms is such as is found in all first-class hotels. The number of rooms is twenty-four, including six larger ones, of which one is a drawing-room, in which smoking is not permitted, and which contains a piano. Everything—doors, sunblinds, furniture, &c.—has been made in, and, with a thousand other objects, imported from Holland. Even the timber of the beams had to be brought from abroad, being derived partly from Trieste and partly from Alexandria.

PRIVATE BILL LEGISLATION.

During the last few weeks the committees of both Houses of Parliament have been busily engaged in the investigation of the several private Bills in respect of proposed new works, and already some decisions of importance affecting several of the projects have been arrived at. Amongst the Bills disposed of is that of the London and Brighton Company, which seeks, amongst other things, powers to appropriate twelve acres of Mitcham Common for the construction of a new branch railway. The proposal was opposed before the Committee, on the ground that it involved the partial appropriation of an open space, and one of those Metropolitan commons which belong to the public for recreation purposes. The evidence given before the Committee on behalf of the Company was to the effect that, if they were allowed to make the railway over the common as proposed, the Wimbledon and Croydon line would be much relieved, and the public benefited. Mr. Bidder, Q.C., who appeared for the opponents of the Bill, asked the Committee, on public grounds, to put a stop to what he designated as "these railway invasions of the open spaces of the Metropolis," which had been too long treated as no man's land, to which anyone had a right. The Committee, after deliberating a few minutes, refused their sanction to this part of the Bill. Mitcham Common is therefore, for the present at least, saved. The next part of the Bill proceeded with was the application of the Company to obtain possession of the New Cross station of the East London Company for siding purposes. It was urged on behalf of the London and Brighton Company that inasmuch as the trains of the East London Company now ran into the Brighton Company's New Cross station, the former Company had no further use for their New Cross terminus; but the East London Company strongly opposed the application, alleging that in consequence of the Brighton Company having failed to carry out traffic agreements, they (the East London Company) might require the station in connexion with new and extended lines beyond New Cross. Sir John Hawkshaw, the engineer of the East London line, having given evidence against the Brighton Company's application receiving parliamentary sanction, the Committee rejected it, and the East London retain their New Cross station.

The Bill of the Brighton Aquarium Company is also amongst those which have been disposed of by the committees. The Company applied for powers to raise the flat roof of the Aquarium buildings for the purposes of ventilation, by means of domes with ventilating fans. The Bill was opposed by the Corporation of London-super-Mare, their allegation being that the raising of the roof high above the level of the roadway might be an unsightly object, and obstruct the sea view from the adjoining houses. On this objection being raised the Committee ruled that it was not expedient to proceed with the Bill, and it was withdrawn.

The Bill jointly promoted by the Alexandra Palace Company and the Muswell Hill Estate Company, is expected to come before the Committee, next week. The Bill seeks powers for building on the Muswell Hill Estate. The preamble states that the Alexandra Palace is built, and the Palace grounds laid out, as a place of public resort and recreation, but that the receipts have been found inadequate to the maintenance of the Palace and grounds on so large a scale; and that it would tend to the future success of the undertaking if a considerable part of the grounds now set apart for public resort and recreation were discharged from the condition contained in the 25th section of the Act of 1866, under which it is provided that the Palace and grounds "shall be continued as a place of public resort and recreation for ever." The first clause of the Bill authorises the sale of certain portions of the land for building purposes, and another clause empowers the Palace Company and the Estate Company to enter into agreements for keeping open the Palace and the remainder of the grounds.

The Board of Trade has just issued their report upon all the railway, canal, tramway, gas, and water Bills for the session, from which it appears that the number of Bills which relate to railways and canals amounts to 116. The number of Bills promoted by existing companies is 91, for the construction of 221 miles of railway, the proposed capital for which is 19,807,750*l*. The number of these Bills in respect of English lines is 68; Scottish, 12; and Irish, 11. The number of Bills promoted by new companies, 25, for the construction of 258 miles of railway, at an outlay of 5,508,600*l*. The English Bills are 21 in number, Scottish, 1, and Irish, 3. The total length of these new lines proposed by existing and new companies being 479 miles, and the aggregate proposed capital, 25,316,350*l*. The number of Bills which relate to tramways is 16, for the construction of 51 miles, at a proposed outlay of 752,600*l*. The number of Bills in respect of proposed English tramways is 11; Scottish, 2; and Irish, 3, The number of Bills which relate to the supply of gas is 43, for the construction of new works, at a proposed outlay of 2,815,100*l*. Of the entire number of these Bills, 35 are in respect of works in England, 2 in Scotland, and 6 in Ireland. The Bills in respect of water-supply are 21 in number, and the proposed expenditure 2,960,000*l*. The English Bills are 18 in number, and the Scottish 3. The aggregate number of railway, canal, tramway, gas, and water Bills is 196, and the proposed expenditure 31,854,050*l*. In addition to the foregoing, the number of applications made to the Board of Trade for provisional orders relating to tramways and the supply of gas and water amounts to 28, all of which are for undertakings in England, at a proposed aggregate outlay of 404,882*l*. The largest amount of capital proposed to be raised under the Bills by existing railway companies is by the Great Northern Company, which proposes to raise 5,199,600*l*., for the construction of about 75 miles of additional railway and other works.

JOINTS IN WOODWORK.

CIVIL AND MECHANICAL ENGINEERS' SOCIETY.

At a meeting of this Society held on the 1st ult., Mr. R. M. Bancroft, president, in the chair, a paper on "Joints in Woodwork" was read by Mr. Henry Adams, A.I.C.E. and M.Inst.M.E., Lecturer on Engineering at the City of London College. The following is the substance of the paper:—

This subject is seldom treated in a sufficiently systematic manner in the text-books used by the junior members of the profession, especially as among engineers iron is looked upon as the staple material of construction, the properties and economical uses of which receive in consequence an almost exclusive share of their attention. Although wood is used much less than formerly in permanent structures, it is still of sufficient importance to warrant a careful study of its nature, properties, and uses.

All trees are divided by botanists into three classes,—*exogens*, or outward-growers; *endogens*, or inward-growers; and *acrogens*, or summit-growers, according to the relative position in which the new material for increasing the substance of the tree is added, viz., whether towards the outside, the inside, or the top. Typical trees of each class would be the oak, the palm, and the tree-fern. We have to deal with the exogenous class only, as that furnishes the timber in general use for construction, the term "timber" including all varieties of wood which, when felled and seasoned, are suitable for building purposes.

If the stem of an exogenous tree be cut across, it will be found to exhibit a number of

nearly concentric rings, more or less distinct, and, in certain cases, radial lines intersecting them. These rings represent the annual growth of the tree, which takes place just under the bark. Each ring consists of bundles of woody fibre, or vascular tissue, in the form of long, tapering tubes, interlaced and breaking joint with each other, having a small portion of cellular tissue at intervals. Towards the outer edge of each ring the woody fibre is harder, more compact, and of a darker colour than the remaining portion. The radial lines consist of thin hard vertical plates, formed entirely of cellular tissue, known to botanists as "medullary rays" and to carpenters as "silver grain." As the tree advances in age the rings and rays become more irregular, the growth being more vigorous on the sunny side, causing distortion. It must be borne in mind that the strength of wood "along the grain" depends on the tenacity of the walls of the fibres and cells; while the strength "across the grain" depends on the adhesion of the sides of the tubes and cells to each other.

Tredgold proposed a classification of timber according to its mechanical structure. This, as modified by Professor Rankine, is given in the following table:—

Class I. Pine-wood (coniferous trees):—Pine, fir, larch, cowrie (New Zealand pine), yew, cedar, &c.
Class II. Leaf-wood (non-coniferous trees):—Division I., with distinct large medullary rays; Sub-division I., annual rings distinct:—Oak; Sub-division II., annual rings indistinct:—Beech, alder, plane, sycamore, &c.
Division II., no distinct large medullary rays:—Sub-division I., annual rings distinct,—chestnut, ash, elm, &c. Sub-division II., annual rings indistinct,—mahogany, teak, walnut, box, &c.

Having glanced at the microscopical structure of the wood, we shall be in a position to understand the process of seasoning and the shrinking incidental to that operation. While wood is in a growing state there is a constant passage of sap or nutritive fluid, which keeps the whole of the interior of the tree moist and the fibres distended; but more especially towards the outside. When the tree is cut down and exposed to the air the moisture gradually evaporates, causing the fibres to shrink according to certain laws; this is the natural process of seasoning. There are various methods of seasoning timber artificially; in each case the object in view is to expedite the process of evaporation. The shrinkage in length is very slight, and need not therefore be considered, but the shrinkage transversely is so great that it is necessary to look closely into the nature of it, as the question of jointing is affected considerably thereby. The behaviour of timber in shrinking was demonstrated by Dr. Anderson in one of the Cantor lectures at the Society of Arts, of which the author of this paper has availed himself to some extent.

As the moisture evaporates, the bundles of woody fibres shrink and draw closer together, but this contraction cannot take place radially without crushing or tearing the hard plates forming the medullary rays, which are unaffected in size by the seasoning. These plates are generally sufficiently strong to resist the crushing action, and the contraction is therefore compelled to take place in the opposite direction, i.e., circumferentially, the strain finding relief by splitting the timber in radial lines, allowing the medullary rays in each partially severed portion to approach each other in the same direction as the ribs of a lady's fan when closing. The illustration of a closing fan affords the best example of the principle of shrinking during seasoning, every portion of the wood practically retaining its original distance from the centre. If the tree were sawn down the middle, the cut surfaces, although flat at first, would in time become rounded, the outer portion shrinking more than that nearer the heart, on account of the greater mass of woody fibre it contains and the larger amount of moisture. If cut into quarters each portion would present a similar result.

If we assume the tree to be cut into planks, then, after allowing due time for seasoning, it will be found that the planks have altered their shape. Taking the centre plank first, it will be observed that the thickness at the middle remains unaltered, at the edge it is reduced, and both sides are rounded, while the width remains unaltered. The planks on each side of this are rounded on the heart side, hollow on the other, retain their middle thickness, but are reduced in proportion to their distance from the centre of the tree; or, in other words, the more nearly the annual rings are parallel to the sides of the planks the greater will be the reduction in width. These remarks apply more especially to oak, beech, and the stronger home firs. In the softer woods the medullary rays are more yielding, and this slightly modifies the result, but the same principles must be borne in mind if we wish to avoid the evils of shrinking which may occur from negligence in this respect. The peculiar direction which "shakes," or natural fractures, sometimes take is due to the unequal adhesion of the woody fibres, the weakest part yielding first. In a "cup-shake," which is the separation of a portion of two annual rings, the medullary rays are deficient in cohesion. So far we have considered the shrinking only as regards the cross section of various pieces. Turning now to the effect produced when we look at the timber in the other direction, if we take a piece of timber with the end cut off square, as this shrinks the end still remains square, the width alone being affected. If, however, the end be bevelled we shall find that in shrinking it assumes a more acute angle, and this should be remembered in framing roofs, arranging the joists for struts, &c., especially by the carpenters who have to do the actual work of fitting the parts.

We may now leave the question of shrinkage and proceed to a consideration of the more immediate object of the paper. In the following table an attempt has been made to classify timber under the different terms by which it is known according to its size and other accidental characteristics. This is only a rough approximation, as no definite rule can be laid down, but it may be of some assistance to those who have occasionally to deal with workmen using the terms.

Classification of Timber according to Size (approximate).

	In.	In.	In.	In.
Balk	12	by 12	to 18	by 18
Whole timber	9	„ 9	„ 15	„ 15
Half timber	9	„ 4½	„ 18	„ 9
Scantling	6	„ 4	„ 13	„ 12
Quartering	2	„ 2	„ 6	„ 6
Planks	11	to 18 by	3	to 6
Deals	9	by 2	to 4½	
Battens	4½	to 7 by	½	„ 3
Strips and laths	2	„ 4½	„ ½	„ 1½

Pieces larger than planks are generally called timber, but when sawn all round are called scantling, and when sawn to equal dimensions each way are called die-square. The dimensions (width and thickness) of parts in a framing are sometimes called the scantlings of the pieces. The term "deal" is also used to distinguish wood in the state ready for the joiner from "timber," which is wood prepared for the use of the carpenter. A "log" or "stick" is a rough whole timber unsawn.

The use of wood may be discussed under the two heads of carpentry and joinery. The former consists principally of the use of large timbers, either rough, adzed, or sawn; and the latter of smaller pieces, always sawn, and with the exposed surfaces planed. The carpenters' work is chiefly out-door; it embraces such objects as building timber bridges and gantries, framing roofs and floors, constructing centreing, and other heavy or rough work. The joiners' work is mostly indoors; it includes laying flooring, making and fixing doors, window sashes, frames, linings, partitions, and internal fittings generally. In all cases the proper connexion of the parts is an essential element, and in designing or executing joints and fastenings in woodwork, the following principles laid down by Professor Rankine should be adhered to, viz.:—

1st. To cut the joints and arrange the fastenings so as to weaken the pieces of timber that they connect as little as possible.
2nd. To place each abutting surface in a joint as nearly as possible perpendicular to the pressure which it has to transmit.
3rd. To proportion the area of each surface to the pressure which it has to bear, so that the timber may be safe against injury under the heaviest load which occurs in practice, and to form and fit every pair of such surfaces accurately in order to distribute the stress uniformly.
4th. To proportion the fastenings so that they may be of equal strength with the pieces which they connect.
5th. To place the fastenings in each piece of timber so that there may be sufficient resistance to the giving way of the joint by the fastenings shearing or crushing their way through the timber.

To these may be added a sixth principle not less important than the foregoing, viz., to select the simplest forms of joints, and to obtain the smallest possible number of abutments. The reason for this is that the more complicated the joint, or the greater the number of bearing surfaces, the less probability there will be of getting a sound and cheaply-made connexion. To ensure a fair and equal bearing in a joint which is not quite true, it is usual after the pieces are put together to run a saw-cut between each bearing surface or abutment; the kerf or width of cut being equal in each case the bearing is then rendered true; this is often done, for instance, with the shoulders of a tenon or the butting ends of a scarf, when careless workmanship has rendered it necessary. When the visible junction of two pieces is required to be as close as possible, and no great strain has to be met at the joint, it is usual to slightly undercut the parts and give clearance on the inside. In pattern-making the fillets which are placed at the internal angle of two meeting surfaces are made obtuse-angled on the back, in order that when bradded into place the sharp edges may lie close. The prints used by pattern-makers for indicating the position of round-cored holes are also undercut by being turned slightly hollow on the bottom. This principle is adopted in nearly all cases where a close joint is a desideratum. Clearance must also be left in joints of framing when a settlement is likely to take place, in order that after the settlement the abutting surfaces may take a fair bearing to resist the strain.

The various strains that can come upon any member of a structure are:—*Tension*, stretching or pulling; *compression*, crushing or pushing; *transverse strain*, cross strain or bending; *torsion*, twisting or wrenching; and *shearing*, cutting; but in woodwork, when the latter force acts along the grain, it is generally called *detrusion*, the term shearing being limited to the action across the grain. The first three varieties are the strains which usually come upon ties, struts, and beams respectively. The transverse strain, it must be observed, is resolvable into tension and compression, the former occurring on the convex side of a loaded beam, and the latter on the concave side, the two being separated by the neutral axis or line of no strain. The shearing strain occurs principally in beams, and is greatest at the point of support, the tendency being to cut the timber through at right angles to the grain; but in nearly all cases if the timber is strong enough to resist the transverse strain, it is amply strong for any possible shearing strain which can occur.

Keys and other fastenings are especially subject to shearing strain, and it will be shown in that portion of our subject that there are certain precautions to be adopted to obtain the best results.

The following tables will serve as an introduction to the remaining portion of the paper:—

Classification of Joints in Carpentry.

Joints for lengthening ties, struts, and beams:—Lapping, fishing, scarfing, tabling, building up.
Bearing-joints for beams:—Halving, notching, cogging, dovetailing, tusk-tenoning, housing, chase-mortising.
Joints for posts and beams:—Tenon, joggle, bridle, housing.
Joints for struts with ties and posts:—Oblique tenon, bridle, toe-joint.
Miscellaneous:—Butting, mitreing, rebating.

Classification of Fastenings in Carpentry.

Wedges; keys.
Pins:—Wood pins, nails, spikes, trenails, screws, bolts.
Straps; sockets.
And for joinery must be added glue.

We will consider these joints in the order given above. One of the first requirements in the use of timber for engineering purposes is the connexion of two or more beams to obtain a greater length. One method of doing this is by lapping, the two pieces being held together by straps, and prevented from sliding by the insertion of keys. A similar joint may be made by using through-bolts instead of straps, and wrought-iron plates instead of oak keys. This makes a neater joint than the former, but they are both unsightly, and whenever adopted the beams should be arranged in three or five pieces in order that the supports at each end may be level, and the beams horizontal. This joint is more suitable for a cross strain than for tension or compression. The common form of fished beam is adapted for compression; if required to resist tensile strain keys should be inserted in the top and bottom joints between the bolts.

Tabling consists in bedding portions of one beam into the other longitudinally. Occasionally the fishing pieces are tabled at the ends into the beams to resist the tendency to slip under strains, but this office is better performed by keys, and in practice tabling is not much used. The distinction between fished beams and scarfed beams is that in the former the original length is not reduced, the pieces being butted against each other, while in the latter the beams themselves are cut in a special manner, and lapped partly over each other; in both cases additional pieces of wood or iron are attached to strengthen the joint. A form of scarf adapted to short posts has the scarf cut square and parallel to the sides, so that the full sectional area is utilised for

resisting the compressive strain. When the post is longer, and liable to a bending strain, the scarf should be inclined, to allow of greater thickness being retained at the shoulder of each piece, the shoulder being kept square. In this joint a considerable strain may be thrown on the bolts from the sliding tendency of the scarf, if the shoulders should happen to be badly fitted, as any slipping would virtually increase the thickness of the timber where the bolts pass through. The width of each shoulder should be not less than one-fourth the total thickness. Joints in posts are mostly required when it is desired to lengthen piles already driven, to support a superstructure in the manner of columns. Another form of scarf for a post put together without bolts has the parts tabled and tongued, and held together by wedges. This is not a satisfactory joint, and is, moreover, expensive because of its requiring extra care in fitting, but it may be a suitable joint in some special cases in which all the sides are required to be flush. In the common form of scarf, in a tie-beam, the ends of the scarf are bird-mouthed, and the joint is tightened up by wedges driven from opposite sides. It is further secured by the wrought-iron plates on the top and bottom, which are attached to the timber by bolts and nuts. In all these joints the friction between the surfaces due to the bolts being tightly secured up plays an important part in the strength of the joint, and as all timber is liable to shrink, it is necessary to examine the bolts occasionally, and to keep them well tightened up. Sometimes the scarf is made vertically instead of horizontally, and when this is done a slight modification is made in the position of the projecting tongue. The only other scarfs to which attention need be called are those in which the compression side is made with a square abutment. These are very strong forms, and at the same time easily made. Many other forms have been designed, and old books on carpentry teem with scarfs of every conceivable pattern, but in this as in many other cases the simplest thing is the best, as the whole value depends upon the accuracy of the workmanship, and this is rendered excessively difficult with a multiplicity of parts or abutments.

In building up beams to obtain increased strength, the most usual method is to lay two together sideways for short spans, as in the lintels over doors and windows, or to cut one down the middle and reverse the halves, inserting a wrought-iron plate between, as in the flitch-girders. The reversal of the halves gives no additional strength, as many workmen suppose, but it enables one to see if the timber is sound throughout at the heart, and it also allows the pieces to season better. A beam uncut may be partially decayed in the centre, and hence the advantage of cutting and reversing, even if no flitch-plate is to be inserted, defective pieces being then discarded. When very long and strong beams are required, a simple method is to bolt several together, so as to break joint with each other, taking care that on the tension side the middle of one piece comes in the centre of the span with the two nearest joints equidistant. It is not necessary in a built beam to carry the full depth as far as the supports. The strain is, of course, greatest in the centre; and, provided there is sufficient depth given at that point, the beam may be reduced towards the ends, allowance being made for the loss of strength at the joints on the tension side. A single piece of timber secured to the underside of a beam at the centre is a simple and effective mode of increasing its strength. The straps are bedded into the sides of the beams: they thus form keys to prevent the pieces from slipping on each other. This weakens the timber much less than cutting out of the top or bottom, as the strength of a beam varies only in direct proportion to the breadth, but as the square of the depth. The addition of a second piece of timber in the middle is a method frequently adopted for strengthening shear-legs and derrick-poles temporarily for lifting heavy weights.

We now come to the consideration of bearing-joints for beams, the term "beam" being taken to include all pieces which carry or receive a load across the grain. The simplest of these is the halving-joint, where two pieces of cross bracing are halved together, or where the ends of two wall-plates meet each other. When the joint occurs in the length of a beam, it is generally called a scarf. In each of these examples, half the thickness of each piece is cut away so as to make the joint flush top and bottom. Sometimes the outer end of the upper piece is made thicker, forming a bevelled joint, and acting as a dovetail when loaded on top. When one beam crosses another at right angles, and is cut on the lower side to fit upon it, the joint is known as single notching; when both are cut, it is known as double notching. These forms occur in the bridging and ceiling joists of double and double-framed flooring. When a cog or solid projecting portion is left in the lower piece at the middle of the joint, it is known as cogging, cocking, or caulking. Dovetailing is not much used in carpentry or house joinery, owing to the shrinkage of the wood loosening the joint. A wedge is sometimes inserted on the straight side to enable the joint to be tightened up, as the wood shrinks. Tredgold proposed the form known as the "Tredgold notch," but this is never seen in practice. Tusk-tenoning is the method adopted for obtaining a bearing for one beam meeting another at right angles at the same level. This occurs round fireplaces, hoistways, and other openings through floors. The advantage of this form is that a good bearing is obtained without weakening the beam to any very great extent, as the principal portion of the material removed is taken from the neutral axis, leaving the remainder disposed somewhat after the form of a flanged girder. When a cross piece of timber has to be framed in between two beams already fixed, a tenon or chase-mortise is one of the methods adopted. If the space is very confined, the same kind of mortise is made in both beams, but in opposite directions. The cross piece is then held obliquely, and slid into place. Occasionally it is necessary to make the chase-mortise vertical, but this is not to be recommended, as the beam is more weakened by so doing. In some cases a square fillet is nailed on to take the weight of the joists, without cutting into the beam. While speaking of floors, the process of firring-up may be mentioned. This consists of laying thin pieces or strips of wood on the top of the joists or any surfaces to bring them up to a level. Firring-pieces are also sometimes nailed underneath the large beams in framed floors, so that the underside may be level with the bottom of the ceiling-joists, to give a bearing for the laths, and at the same time allow sufficient space for the plaster to form a key. Housing consists of letting one piece of wood bodily into another for a short distance, or as it were a tenon the full size of the stuff. The treads and risers of staircases are housed into the strings, and held by wedges. Housing is likewise adopted for fixing rails to posts. The most common joint, however, between posts and beams is the tenon and mortise joint, either wedged or fixed by a pin. The friction of the wedges when tightly driven, aided by the adhesion of the glue or white lead with which they are coated, forms in effect a solid dovetail, and the fibres, being compressed, do not yield further by the shrinking of the wood. When it is desired to tenon a beam into a post without allowing the tenon to show through, or where a mortise has to be made in an existing post fixed against a wall, the dovetail tenon is sometimes adopted, a wedge being driven in on the straight side to draw the tenon home and keep it in place. In joining small pieces the foxtail tenon has the same advantage as the dovetail tenon, of not showing through, but it is more difficult to fix. The outer wedges are made the longest; and in driving the tenon home these come into action, first splitting away the sides and filling up the dovetailed mortise, at the same time compressing the fibres of the tenon. This joint requires no glue, as it cannot draw out. Should it work loose at any time, the only way to tighten it up would be to insert a very thin wedge in one end of the mortise. Short tenons, assisted by strap bolts, are commonly adopted in connecting large timbers. The post is cut to form a shoulder, so that the beam takes a bearing for its full width, the tenon preventing any side movement. When a post rests on a beam or cill-piece, its movement is prevented by a "joggle," or stub-tenon. But too much reliance should not be placed on this tenon, owing to the impossibility of seeing, after the pieces are fixed, whether it has been properly fitted. It is also particularly liable to decay, from moisture settling in the joint. For temporary purposes posts are commonly secured to heads and cills by dog-irons or "dogs"; the pieces in this case simply butt against each other, the object being to avoid cutting the timber, and so depreciating its value, and also for economy of labour. The double tenon is used in framing wide pieces, and the haunched tenon when the edge of the piece on which the tenon is formed is required to be flush with the end of the piece containing the mortise. Tredgold recommended a bridle joint with a circular abutment, but this is not a correct form, as the post is then equivalent to a column with rounded ends, which, it is well known, is unable in that form to bear so great a load before it commences to yield. A strut meeting a tie, as in the case of the foot of a principal rafter in a roof truss, is generally tenoned into the tie by an oblique tenon, and the joint is further strengthened by a toe on the rafter bearing against a shoulder in the tie. Tredgold strongly advised this joint being made with a bridle instead of a tenon, on account of the butting surfaces being fully open to view. A strut meeting a post, or a strut meeting the principal rafter of a roof-truss, is usually connected by a simple toe joint. The shoulder should be cut square with the piece containing it, or it should bisect the angle formed between the two pieces. It is sometimes made square with the strut; but this is incorrect, as there would, in some cases, be a possibility of the piece slipping out. In ledged and braced doors or gates, this joint is used, the pieces being so arranged as to form triangles and so prevent the liability to sag or drop, which is so difficult to guard against in square-framed work without struts or braces. When a structure is triangulated its shape remains constant so long as the fastenings are not torn away, because, with a given length of sides a triangle can assume only one position; but this is not the case with four-sided framing, as the sides, while remaining constant in length, may vary in position. Among the miscellaneous joints in carpentry not previously mentioned, the most common are the butt joint, where the pieces meet each other with square ends or sides, the mitre-joint, where the pieces butt against each other with bevelled ends, bisecting the angle between them as in the case of struts mitred to a corbel-piece supporting the beam of a gantry, and the rabetted or "rebated" joint, which is a kind of narrow halving, either transverse or longitudinal. To these must be added, in joinery, the grooved and tongued joint, the matched and beaded joint, the dowelled joint, the dovetailed joint, and other modifications of these to suit special purposes. "Flooring laid folding" is a method of obtaining close joints without the use of a cramp. It consists of nailing down two boards, and leaving a space between them rather less than the width of, say, five boards. These boards are then put in place, and the two projecting edges are forced down by laying a plank across them, and standing on it. This may generally be detected in old floors, by observing that several heading joints come in one line, instead of breaking joint with each other. It is worthy of notice that the tongue or slip feather, which in good work is formed generally of hard wood, is made up of short pieces, cut diagonally across the grain of the plank, in order that any movement of the joints may not split the tongue, which would inevitably occur if it were cut longitudinally from the plank.

With regard to fastenings, wedges should be split or torn from the log so that the grain may be continuous, or, if sawn out, a straight-grained piece should be selected. Sufficient taper should be put on to give enough compression to the joint, but too much taper would allow the possibility of the wedge working loose. For outside work wedges should be painted over with white-lead before being driven, this not being affected by moisture as glue would be. In scarf-joints the chief use of wedges is to draw the parts together before the bolt-holes are bored. Keys are nearly parallel strips of hard wood or metal; they are usually made with a slight draft to enable them to fit tightly. If the key is cut lengthways of the grain, a piece with curled or twisted grain should be selected, but if this cannot be done the key should be cut crossways of the log from which it is taken and inserted in the joint with the grain at right angles to the direction of the strain, so that the shearing stress to which the key is subject may act upon it across the fibres. In timber bridges and other large structures cast-iron keys are frequently used, as there is with them an absence of all difficulty from shrinkage. Wood pins should be selected in the same way as wedges from straight-grained hard wood. Square pins are more efficient than round pins, but are not often used on account of the difficulty of forming square holes for their reception. Tenons are frequently secured in mortises by pins, the pins being driven in such a manner as to draw the tenon tightly into the mortise up to its shoulders and afterwards

to hold it there. This is done by boring the hole first through the cheeks of the mortise, then inserting the tenon, marking off the position of the hole, removing the tenon, and boring the pin-hole in it rather nearer the shoulders than the mark, so that when the pin is driven it will draw the tenon as above described. The dowelled floor gives another example of the use of pins.

Nails and their uses are too well known to need description; it may, however, be well to call attention to the two kinds of cut and wrought nails, the former being sheared or stamped out of plates, and the latter forged out of rods. The cut nails are cheaper, but are rather brittle; they are useful in many kinds of work, as they may be driven without previously boring holes to receive them, being rather blunt-pointed and having two parallel sides which are placed in the direction of the grain of the wood. The wrought nails do not easily break, and are used where it is desired to clench them on the back to draw and hold the wood together. The following table gives the result of some experiments on the adhesion of nails and screws:—

Adhesion of Nails (Experiments by Mr. Bevan).

Description of Nails used.	No. to the lb. avoir.	Inches long.	Inches forced into wood.	lb. pressure to force in dry Christiana deal.	lb. pressure to extract from dry Christiana deal.
Fine sprigs	4560	1·44	·40	—	23
,, ,, ...	3200	0·83	·44	—	37
Threepenny brads	618	1·25	·50	—	58
Cast-iron nails	380	1·00	·50	—	72
Sixpenny nails.....	73	2·50	·25	24	—
,, ,, ...	,,	,,	·50	76	—
,, ,, ...	,,	,,	1·00	235	187†
,, ,, ...	,,	,,	,,	end grain	= 87‡
,, ,, ...	,,	,,	1·50	400*	327
,, ,, ...	,,	,,	2·00	610	530
,, ,, ...	,,	,,	,,	end grain	= 257
Fivepenny nails ...	139	2·00	1·50	—	320

Summary.	Across grain.		With grain.
Adhesion of nails in deal	2	to	1
,, ,, elm	4	to	3

Entrance to extraction is as 6 to 5.

Common screw ·2 in. diameter = 3 times the adhesive force of a sixpenny nail.

Spikes are nearly of the same form as nails, but much larger, and are mostly used for heavy timber work. Trenails are hard wood pins used in the same way as nails. In particular work with some woods, such as oak, they are used to prevent the staining of the wood, which would occur if nails were used and any moisture afterwards reached them. Compressed trenails are largely used for fixing railway chairs to sleepers, as they swell on exposure to moisture and then hold more firmly. Screws are used in situations where the parts may afterwards require to be disconnected. They are more useful than nails, as they not only connect the parts, but draw them closer together, and are more secure. For joiners' work the screws usually have countersunk heads. Where it is desired to conceal them, they are let well into the wood, and the holes plugged with dowels of the same kind of wood, with the grain in the same direction. For carpenters' work the screws are larger, and have often square heads. These are known as coach-screws. The bolts, nuts, and washers used in carpentry may be of the proportions given in the following table:—

Thickness of nut	=	1 diam. of bolt.
Ditto head.....	=	⅞ ditto
Diameter of head or nut over sides	=	1½ ditto
Side of square washer for fir.....	=	3½ ditto
Ditto ditto oak	=	2½ ditto
Thickness of washer.....	=	¼ ditto

The square nuts used by carpenters are much too thin, unless they are equal in thickness to the diameter of the bolt. The full advantage of that diameter cannot be obtained, the strength of any connexion being measured by its weakest part. A large square washer is generally put under the nut to prevent it from sinking into the wood and tearing the fibres while being screwed up, but it is also necessary to put a similar washer under the head to prevent it sinking into the wood. This is, however, often improperly omitted. Straps are bands of wrought iron placed over a joint to strengthen it and tie the parts together. When the strap is carried round one piece, and both ends secured to a piece joining it at right angles, as in a king-post and tie-beam, it is known as a stirrup, and is tightened by means of a cottar and gib keys. When straps connect more than two pieces of timber together, they are made with a branch leading in the direction of each piece, but they are usually not strong enough at the point of junction, and might often be made shorter than they are without impairing their efficiency; sockets are generally of cast iron, and may be described as hollow boxes formed to receive the ends of timber framing.

The author has confined himself principally to those joints which are used in general construction; many others might have been mentioned, but not being required in ordinary practice they have been omitted, to avoid extending the paper to an undue length. He cannot conclude without acknowledging the assistance he has derived from the works of Tredgold, Rankine, and others, which contain valuable tables and information relating to the subject under consideration. His thanks are also due to the council of the City of London College for the loan of a set of fifty models of joints. Other joints were illustrated by a few larger models, and one of these, a quadruple dovetail, may be referred to as a curiosity of jointing.

* Or 4 blows by weight of 6·275 lb. falling freely through 1 foot.

† These nails required a pressure of 327 lb. to extract them from dry elm; 507 lb. from dry oak; 667 lb. from dry beech; and 312 lb. from green sycamore.

‡ These required a pressure of 257 lb. to extract them from dry elm.

ECCLESIASTICAL DECORATION, WITH SPECIAL REFERENCE TO THE CHURCH OF ST. FRANCIS, ASSISI.*

DURING the residence of the imperial court in the city of Byzantium, Rome had been left unprotected from the ravages of time, and defenceless from the still greater and more disastrous assaults of its barbarian invaders; but when it became again the heart of a mighty religious system, animated by the spirit of renewed energy, then those fragments of marble with which the city was strewed, and which had no doubt constituted parts of beautiful statues and graceful columns, became the means of reviving a special feature which was applied to the embellishment of church interiors,—I refer to the adaptation of marble mosaics for floors, a singularly effective treatment, and one that falls into such complete unison with the grandeur of the architectural accessories, particularly when in relation to marble pillars.

It was also extensively employed for the production of coloured or variegated decorative effects, executed in every conceivable manner, and rendered highly serviceable in relieving and enlivening large monotonous surfaces, while it came in with charming effect in the decoration of pulpits and altars.

This art reached its highest point of development in the Alexandrine age, although differing somewhat in design and in the nature of the materials used from what I have just referred to, which was generally worked with pieces of marble cut into geometrical shapes and polished before being laid down. The ancients used cubes of coloured glass, vitrified but opaque, and also clay which was hardened, coated with various oxides of metals, and subsequently polished after the cement by which they were fixed was thoroughly hardened. Precious stones were also frequently employed when certain effects were desired, as well as for the purpose of enhancing the value of the subject.

Mural painting appears not only to have revived, but it seems likewise to have kept pace with the art enthusiasm of the period, and as the times, glowing with religious ardour, demanded as subjects representations illustrative of the devout lives and pious works of those who had become conspicuous by special acts, or identified themselves with those schemes which were best calculated to extend the dominion of the Church. And in addition to these motives, there was also the embodiment of the loftiest sentiments, in Scriptural compositions, taken from Old and New Testament narratives, which called into practice the greatest artistic skill and talent.

Foremost amongst many eminent names, there is none which occupies a higher place in the active religious life of the thirteenth century than that of St. Francis of Assisi. He was richly endowed with all the qualifications which renders a man distinguished and powerful, particularly when under the influence of a strong enthusiasm. And not only did he possess these, but he also enjoyed the rarer and more subtle gift of drawing his fellow-men to him, and imbuing them with his peculiar sentiments and convictions. Indeed, so strong was the veneration in which he was held, even in his lifetime, that numerous miracles are ascribed to him, which were not merely acknowledged, but were also ratified by the authority of the Church, who conferred its highest honour on his name. And so great was the sanctity in which he lived, that the close of his earthly career, so far from diminishing it, rather tended to increase it, and it still survives, and with the memory of his good works it is held in the highest estimation, as that of one of the most revered and cherished names inscribed on the long roll of the saintly calendar.

At his death there was erected over his tomb the magnificent monumental church which, bearing his name, was dedicated to his memory, and, in order to maintain that interest in the story of his life and work which the Church knew was so essential to keep alive, not only the recollection of the individual, but also to answer the double purpose of inspiring others with kindred aspirations to contribute towards its power and advancement. Mere historical narrative was deemed insufficient in that age of ignorance and superstition to attain this end. They relied with more confidence in the power of the artist to convey the ideas they wished to impress on the minds of the people. They were well aware that, when depicted by the hands of an artist whose pencil partook of the enthusiasm of which I have spoken, the most notable incidents of the saint's career, emblazoned in imperishable pictorial characters on his cathedral tomb, would tell, for all time, to all nations and tongues, his story, with a clearness and energy which no written or spoken language could so strikingly express. It is to this remarkable building that I now wish to direct your special attention, as it is acknowledged to be one of the finest examples we have illustrative of the true employment of colour. It has been truthfully referred to as the rallying ground of the greatest masters in art for upwards of two centuries. Indeed, the whole work seems to have been performed in the highest spirit of devotional art, as each of the masters appears to have been irresistibly attracted hither, and to have vied with his predecessors, in endowing his work with the very loftiest religious sentiment, in pious tribute to the memory of the saint whose deeds he depicted in the most vivid and admirable manner which his imagination could suggest.

The lower church was built two years after the death of St. Francis, namely, in 1232, and twenty-one years later the upper church was begun, the style of architecture being Gothic. The approach to the lower church is by a cloistered quadrangle, and the entrance is adorned by a beautiful Gothic porch, in the centre of the arch of which is placed a fine portrait of St. Francis, wrought in mosaic. On wending our way through the vestibule, we become insensibly impressed by a feeling of solemnity and grandeur, due to the exquisite effect of the harmonious combination of richly-luminous colouring, which, in itself, independent of detail, produces a most lasting sentiment, while it furnishes a most convincing example of the accurate application of colour in relation to church architecture, whether in mural decoration, mosaics, or stained glass. As the religious is the highest form of emotional power which acts on the understanding of man, it reasonably claims the greatest amount of veneration, and in the endeavour to portray, with any degree of success, its action, the mind or intellectual faculty must be reached by a more subtle medium than it would be necessary to employ were it the eye alone which it was sought to charm and satisfy, and therefore all that is pure and harmonious in form and colour must, in order to attain the desired result, demand a severe and scrutinising study before that perfect unison and accordance is obtained which, acting on the external perceptions, gradually creates an inward sympathy, from whence arises exaltation of thought, and concentration and intensity of devout and religious sensibilities. For it is evident that where marked absence of unity exists, or where prominence is given to any individual point, a sensation of discord is conveyed to the mind, rendering it incapable of enjoying that full sense of repose which is inseparable from the ideal of perfection to which all sacred teaching points. But the feeling of perfect harmony is fully realised on entering the hallowed atmosphere which pervades the cathedral of Assisi. Here, in combination with the richest marbles, from which the tomb of the saint is formed, and within the shadowed vaulting over the high altar, are the grand frescoes from the hand of Giotto,

* By Mr. Thomas Bonnar. See p. 295, *ante*.

representing the fundamental rules of the order of St. Francis, namely "Poverty, Charity, and Obedience," and the triumph of the saint, while all around, and glowing with a charming unity of colour, are depicted on the arches and wall surfaces forming the different chapels subjects in which the saints are portrayed as contemplating, with sadness of expression, the scene of their past labours, and these pictures are again encircled by a beatiful framework of coloured detail, following the architectural lines. And although the realistic does not appear to have been studied or known by these painters, there is nevertheless discernible a graceful and meditative expression in singular conformity with the conventionalisms they exhibit in the flat traceries of the draperies, and the absence of perspective.

These works, notwithstanding that they are the productions of different artists, seem to have been animated with a spirit which enabled them to secure a harmony of feeling throughout. Indeed, they are the masterpieces of men who could only have been inspired by the highest religious feelings before they could have succeeded so well in the noble task they so worthily accomplished.

As I have already observed, the knowledge of modelling, or giving relief to the figure, is but faintly indicated in these frescoes; however, a century later, in the works of the youthful Masaccio, executed in the Chapel Brancacci, Florence, there may be discerned evidence of this secret having been discovered and successfully mastered. To this artist and his pupil, Filippo Lippi, may be ascribed an honour similar to that which is so gratefully accorded to their predecessor Giotto, as from the latter, art reassumed a power and dignity which had long lain dormant; while from the former, a century later, it received an impetus which elevated it high above any eminence it had ever before reached, and sent it onward ever increasing in honour and beauty, until it achieved the culminating glory of its existence at the hands of Michelangelo and Raffaelle in the sixteenth century.

It is to these sources that I seek to direct the attention of the architect and decorative artist, as they form the basis of all that is true and harmonious in ecclesiastical embellishment. The details forming the framework composed of the graceful combinations following the architectural lines were all equally considered worthy of employing the careful study of the great masters, and they did not look upon it as beneath their notice to conceive and group in appropriate clusters the different parts which were intended to inclose the most growing conceptions of artistic genius.

Let us, then, study these matters in the spirit by which those men were animated. But at the same time, it is not at all essential that we should follow them in any slavish manner, but rather take the benefit of their teaching in its highest relative capacity, confiding in the potency of the system indicated, when applied with the resources that lie ready to our hands, to develop a method in which all that is justly esteemed as the good and beautiful of the past should be rendered subservient to our aim; while by consistently endeavouring,—though it may be only with a degree of success,—to stamp it with the impress of individuality, we shall only be attempting to realise that end which has been the object of every age and people conspicuous for a sense of progress or originality to accomplish.

And surely it would be unlike ourselves, when we contemplate our triumphs in the various walks of literature and science, were we, in this instance, to confine ourselves by the limitations of what is termed established precedent; for it is a well-known fact that any reproduction in a merely literal form can never have the effect of the original, as it can neither embody the life nor spirit which existed in the primary design. But rather let us, like the originators of the charmingly artistic combinations of which I have spoken, seek in nature our models of forms and tints, and not degrade ourselves to the condition of mechanical imitators.

We are conscious that, with careful study and observation, all the kindred circumstances of suitability, play, and adaptation are to be found in endless variety; and it was from this never-failing medium that the old masters drew their inspirations, and using them in strict accordance to situation and requirement, obtained results so indelibly imprinted on their works that, notwithstanding the centuries which have passed over them, we are enabled to view them in their vigour and gracefulness, and to admire the truly wonderful freshness they continue to retain.

I have now come to the third and last division of my subject, namely, the place and purpose of art in modern decoration. And although I consider this the most important point of my paper, seeing that I have already, I fear, detained you too long, I shall refrain from entering so largely into its merits as I would like to do.

It may, by way of apology, be said that the times in which we live are not so favourable for the expression of thought and ideal, and that in this respect we are placed at a disadvantage, comparatively, with our predecessors. But have we not, in compensation for this, the powerful stimulus of increased and advancing knowledge; with facilities for exercising observation enlarged by experience of the past, with the assistance of improved practical science at our command to render the exposition of decorative art simpler and more efficient in our hands?

Looking abroad on the natural landscape, we discover it composed of broken forms and undulating lines, tinted in all the variety of colour, gradating in degree according to distance; and at no time shall we find any very extensive area under a uniform tint. The effects of light and shade are incessantly at play. The seasons as they change bring their varied hues, the brightest of colours peeping out here and there, but always in minute quantities,—merely sufficient to enhance the value of the surrounding harmony. It is from this aspect that we are enabled, without doubt, to form a fundamental basis of the true arrangement of colour.

Then, take the individual parts of the landscape, and on examination each will be found to exhibit the greatest of contrast to the other, indeed all the colours of the chromatic scale are clearly perceptible to the artistic eye; but all are controlled by that subtle quality of light called atmosphere, by which the degrees of tints are permitted to exercise a subjective influence, and they, again, are invisibly united by the tertiary or middle tint, all combining to produce the effect of a harmonious whole, capable not only of satisfying the eye, but possessing that enduring charm which renders the sense of beauty in nature ever fresh and delightful. And it is necessary for the vitality of art that this special quality should be present in all its phases. Practically, this idea can readily be carried out in the structural employment of colour in ornamentation where conventional forms fall to be treated in harmonious relation to the architectural surroundings. Naturally the dark and richer tints ought to form the base, as in landscape we have presented to us in the foreground richness of colour and minuteness of detail.

The intermediate spaces intervening betwixt base and roof should be glowing in tertiary tones, interspersed with suitable forms in colours taken out of the prevailing tints of the base. And this space might at the same time be varied as suggested by the architectural detail, always as it recedes upwards becoming lighter and less pronounced, similar to the middle distance in nature, where all the tints are soft and pearly, leading the eye as it ascends to the dimly-defined outlines of the hills where they meet and seem to mingle with the blue-vaulted sky.

I have endeavoured to show that nature is the school in which to acquire a knowledge of the true basis of this study, and with the hallowing influence which it exercises on all who love its Divine teaching, it must surely endue the artist with a desire to blend in spiritualised harmony his thoughts, when engaged in efforts to embellish those magnificent sanctuaries raised by the genius of man, and dedicated to the service of the Creator of the universe.

While in pursuit of his art, the church decorator has, of course, to contend with the greatest diversity of opinion and variety of taste which exists in the minds of the different parties interested, and, as may be easily understood, any amount of art-culture is powerless to move the natures of many men who, in other respects, hold the reputation of great intelligence and skilfulness. So that, with such obstacles to be overcome, an essential element of success on the part of the designer is his capability of reconciling, in the best possible manner, the differences of individual taste, and guiding their divergent opinions into a straight and even channel. That this course is not without its dangers is very evident, for there is the taste which only can be satisfied by showiness and glitter, and then the directly opposite one, which looks with abhorrence on everything except that in which severity of treatment prevails. Now it must be admitted that the task of combining successfully such inconsistent ideas cannot be an easy one, as to the cultured mind the first, by its obtrusiveness, creates a sense of discord and harshness, while the second, by its extreme tameness, suggests a feeling of poverty and want of completeness.

I would, therefore, argue from these points, that if decorative art is to be rendered trustworthy, and allowed its proper place and sphere, it ought to have its full degree of prominence assigned to it, always keeping in view the circumstances by which its employment should be governed; and with these continually before him the decorator has little room to fall into error. Indeed, I may be allowed to affirm that all liability to blunder would be entirely obviated by a more wide-spread knowledge of the necessity of adhering strictly to those fundamental principles of design which I have already alluded to.

As tameness is the most prevalent fault in our colouring of church interiors, I may be allowed a few words on this part of the question. Certainly there must be some allowances made when we look to the causes from which this defect has arisen. In most instances it may be traced to the fact that the study and practice of decorative art in this country have, until within the last few years, been almost entirely ignored by those on whose patronage it mainly relied. Consequently, a sense of timidity is observable in the little that has been attempted, and this has not been lessened by the influence of the idea of utter barrenness in this respect which the church has hitherto thought expedient to adopt. This sentiment has, however, to a very great extent succumbed to the advancement of enlightened and growing taste, and happily we shall soon be able to look back on it as a thing of the past.

Architectural beauty of design is now held to be an essential qualification, even to those who we may reasonably suppose were in the habit of viewing these matters from the very strictest standpoint. And the result of this is, that interiors, architecturally as well as in a decorative sense, receive greater attention. But owing to the scarcity of studies and examples to serve as guides to the general public, it has necessarily devolved on the architect and decorator to supply the deficiency. Unfortunately, the growth and development of this art in public estimation has been somewhat retarded, in consequence of the majority of the attempts at its employment having hitherto ended (with but few exceptions) in miserable failure. Much mischief has thereby ensued, for in this, like all other novelties, success was indispensable before public confidence could be gained. Had this branch of decorative art been competently wrought out, and directed into a healthy channel,—when the opportunity arrived,—it might have grown in public favour, and become a necessity in all points, equal to that which the outward architectural embellishment demands. Instead of this the debased productions of the modern ecclesiastical decorator, coming into competition with, and subjected to the scrutiny of, the advanced state of art-knowledge now prevailing; predisposed, naturally, a repellant sentiment, which, in turn, gave rise to an uneasy sense of the necessity of caution on the part of many who otherwise might have been inclined to aid and welcome its introduction, but who, from witnessing the evident failures which have been made, prefer the fresh and unadorned atmosphere of whitewash to enduring the misery of submitting—even for a brief period—to the dismally depressing influence of feeble, sickly colour, and restless discordant forms.

It is melancholy to contemplate (when we bear in mind the advance which has been made in everything else) the meaningless, vague, and undefined efforts of these servile imitators who both weary and vex us with their reproductions of bewildering objects and begrimed tints, the originals of which, doubtless, in their pristine beauty, were glowing with richness of colour when first they adorned the ceilings and walls of Mediæval churches. The decorative forms conveyed a symbolical meaning, which to us has almost become a dead letter, as far as intelligibility is concerned.

Examples of this false and incongruous treatment are not difficult to find, for we have in many of the churches recently constructed—particularly in the south and west—numerous instances in which the decorator has reproduced in their most repulsive manner all the crudities and defects of the most debased Middle-Age period; and, what is more to be deplored, these

are frequently wrought in the permanent method of costly mosaic. Blinded by their own conceit, and that of those who are weak enough to give credence to them, this is ostentatiously announced as the representative art of the nineteenth century; although I think it would be better described as the "Mediæval Mania," as it is founded on a frail and crazy base, created and fostered by that most popular and powerful of tyrants, Fashion, whose transitory allurements, it is to be regretted, exercise so great an influence on its votaries in religious, as well as in secular, matters.

But with true art the case is widely different. It is acknowledged as a genuine medium of sympathetic expression, and far from falling back to the worst period for precedents, prefers to cull and engraft all that is chaste and beautiful, with discriminating care and judgment, and urged forward by the living spirit of progress which animates it, pushes onwards and upwards towards perfection. To the artist and student it forms a delightful and instructive study, and it has always been to the historian a source from whence could be drawn undoubted and authentic information respecting the state of civilisation, and the intellectual and material life and prosperity of a nation.

Surely, in the reproduction of these Byzantinesque subjects,—executed as they are in the enduring medium of mosaic,—a very grave mistake has been committed; for it is almost impossible to look upon them in any other light than the evident purpose which they seem intended to express, namely, a desire to transmit a deliberate falsehood to future generations. Is it not sad to reflect on this? Just conceive us, in the midst of our religious and literary life and progress, being prevailed upon to have recourse to a period of art which we would with justifiable scorn and indignation repudiate were we asked to accept it as our guide in science, literature, or mechanics.

That the work of the Mediæval painter expresses a sincerity and singleness of thought cannot be gainsaid, and I have already borne testimony to the fact in a previous part of this paper. And we, if impelled by a like sentiment, may find in it a field from which to glean rich treasures of the ideal and beautiful, and for this purpose it will continue an excellent medium of assistance in the cultivation of modern taste. But in this manner only can it be of service in educating the public mind.

There are opportunities continually occurring, in which the variety and beauty of architectural design affords ample scope for the artistic display of originality in colour and effect, and these ought to be carefully studied by the decorator. In many churches (especially in those where a certain richness of symbolism and ritual are observed) there are portions, such as the apse or chancel, which, being, as it were, separated from the main or better lighted part of the building, always appear to the eye as if under a veiled aspect, and from the circumstance of the altar, composed of the richest materials, sparkling with gold, being placed there, it is obvious that there exists a necessity for a highly artistic mode of treatment, in which a considerable amount of colour might be introduced with great effect, forming a brilliant background, uniting the various accessories, and combining the whole, realising a unity of purpose which, while it was pleasing to all, contributed to the embellishment of the sanctuary dedicated to the highest purposes of religion.

Our national churches, whether Presbyterian or Episcopal, could, without difficulty, be brought into the same category of ecclesiastical decoration,—the application of rich colouring being modified according to the suitability of the architectural arrangements.

We know from experience, that certain causes which I have already hinted at have tended to introduce and maintain sparseness and tameness of colouring in the ornamentation of our Presbyterian places of worship. And it is in this view of the circumstances that the architect might be instrumental in giving confidence to those desirous of adopting something in the way of internal adornment, but who with the fear of censorious grumblers before them, hesitate to take any steps on their individual responsibility. As a simple way of solving this difficulty, and at the same time preventing failure or incongruity on the part of the decorator, I would suggest that the architect should devise suitable sketches, in conformity with the architectural, or any special features of the building,—to be submitted, and from these it would be an easy matter to make a satisfactory selection: providing of course, that competent persons are encouraged to offer their designs. And such a system conscientiously carried out would, I am confident, ensure commendation from all parties, and be the means of conferring credit on those who had the performance of the various duties.

From my own observation, I am fully convinced that public opinion in matters of taste is gradually beginning to appreciate the importance of this subject; and the interest shown by this Association, in this and kindred matters, is calculated to arouse, and direct public attention to the full significance of its purpose, and by so doing, aid in no small measure in the attainment of the end in view.

THE ROMAN BATHS.*

WHILST speaking on this question of the principle of the formation of the Roman or Classic vault, as distinguished from that of the Mediæval builders, may I be allowed to refer for a moment to my reason for claiming the pendentive and dome of Sta. Sophia as Classic in principle? Intersect a half-sphere by two semi-cylinders running at right angles to one another; the intersection will give four semicircles touching one another at their lower ends. With a horizontal plane touching the top of semicircles cut off the upper part of the dome; there will remain four spherical triangles, which are called pendentives, each constituting an original part the dome. They are contained between the plane above spoken of and the semicircular arches obtained by the intersection with the two cylinders. These semicircular arches may be looked upon as the groins of two intersecting geometrical forms, viz., the sphere and cylinder, just as the intersection of two semi-cylinders forms a groin; that is to say, the form of the groin is dictated and fixed by the natural intersection of the two geometrical forms. And now, as a contrast, let us take the pendentives and dome of St. Front at Perigueux, which is the starting-point of Mediæval domes. Here, instead of circular there are pointed arches, which are not intersections of any known geometrical form; further than that, the pendentives are built on these arches, and are not portions of a sphere; in other words, they are webs, and are built on the pointed arches, which in this case are ribs, both of which are Gothic inventions. Then it has been suggested that the upper portion of the dome of Sta. Sophia being raised constitutes its Mediæval character, but its form is not changed; it is still a dome, although it is stilted. If I wanted an additional proof, I have only to refer to the Temple of Minerva Medica at Rome, built in the third century of our era. It is a decagonal building, and its dome has been intersected by ten planes; but the original domical form is still found in each of the pendentives which carry the superstructure; and, singular to say, even at this period,—and, probably, no one will venture to claim this building as Mediæval,—the upper portions of the dome has been stilted as in Sta. Sophia. With the revival of Classic architecture the Renaissance architects of Italy, and subsequently those of France and England, returned to the dome as their natural birthright, and in the dome of St. Peter's at Rome, the Pantheon at Paris, and St. Paul's in London, not to mention numerous other examples, we find the principle of the dome and pendentives as worked out at Constantinople. The Renaissance and rococo ornament with which they are decorated is out of keeping with the finer mosaic decoration of Sta. Sophia, but in the principle of the formation of their pendentives these domes are built on the elementary form of the Byzantine example. And now, with apologies for my digression, let me return to my subject.

There are three varieties in the form of the barrel vault, such as when constructed over a circular corridor, or rising round a staircase, or, as is found in many of the small rooms, segmental only. The Romans, however, did not always discard the apparent rib. In the Piscina Mirabilis, near Naples, a water reservoir, the roof is carried by a series of square piers supporting ribs, on which are formed intersecting groined vaults; and in the Baths of Diana, at Nismes, the circular barrel vault of the only remaining hall is carried, or rather strengthened, I would say, by a series of ribs, the construction of which and their breaking joint with the vault, is curious. It would seem that here a very heavy weight (the reservoir being over it) had to be carried, which suggested the employment of these ribs as an additional precaution.

I now come to the second great feature of Roman architecture, the dome; and as the dome of the *calidarium* of Caracalla's Baths has almost disappeared, I propose to accept the Pantheon as its model, and to describe that. The latter is, of course, very much larger, but the principles involved in its construction were, as far as one can judge from the remains of the former, the same. The dome of the Pantheon is 141 ft. in diameter, being the largest circular vaulted building in the world. As M. Viollet-le-Duc points out, to have constructed the vault in solid masonry, with continuous centering, would have been an impossibility; the explanation which he gives in his "Dictionnaire Raisonné" has so much correctness of reasoning that I have no hesitation in accepting it. The principle is somewhat the same as that which obtains in the barrel vault, with one exception, however, that the ribs are apparent,—whether they were intended to remain so is not known, for history records that the whole of the dome was covered internally with bronze plates; these were removed by Pope Urban VIII. to use up in the baldacchino of St. Peter's, and for the founding of cannon for the St. Angelo fortress. Although the ribs are apparent, the consecutiveness of the form of the dome is preserved by the ribs and the intermediate ties which divide the whole into square or slightly oblong coffers; these in principle resemble those of the ceilings of the peristyles of Greek temples. There are twenty-eight ribs of brick, which abut at the top against a circular ring of 24 ft. in diameter. The ties between these ribs are flat arches dividing the whole, as I have said, into coffers; the vertical distance of these cross-ribs varies according to the distance between the vertical ribs at the respective heights. Now, instead of filling in these coffers flush with the under-surface with concrete, in order to lighten the vault *scientifically* (whatever the æsthetic idea may have been), four wooden dummies, decreasing in size and depth, were placed one above the other, and the concrete was filled in on these, which, when removed from beneath, left four receding coffers. The shape and position of these coffers leaves no doubt on my mind that the internal construction was from the first intended to have been exposed; for, in order that the edges of the receding coffers should be seen, and to correct the optical delusion when looking at them from below, not only are the lower borders round each coffer deeper than the upper ones, but the soffits of the upper edges are cut into and form acute angles with the edges or borders, whilst the cills rise and form obtuse angles with the borders. This trouble would not have been taken if they were intended to be hidden. This is, however, not all the construction of the vault; the thickness of these ribs already described (about 2 ft.) would have formed too thin a shell to resist the force of the wind and weather which might have been exerted on it. It was necessary, consequently, to form an outer shell, and a new system of construction was devised, which should not only protect the lower shell, but be self-supporting. The ribs and filling-in already constructed formed a permanent centering, so that provided the new shell were built up in equal heights round and in consistence with the principle of formation of a dome, each covering would support itself. The outer shell commenced about one-third above the springing of the inner shell, with sixteen large and sixteen small arches in brick, the *points d'appui* of which came in between those of the inner ribs; above these, and resting on the centres of the large arches, were sixteen other arches; and above them another row, and then, in the interval between the crown of these and the central ring were smaller ribs. The interspaces of these were filled in with concrete, cemented over; and at some later period, which I am not able to tell you, the whole was covered with lead. The discovery of this outer shell was made known to Piranesi, when called upon to restore the lead roof; but curiously enough, he does not seem to have understood the construction of the inner shell, which he regarded only as a decoration, and it remained for the wonderful reasoning faculties of M. Viollet-le-Duc to point out the true meaning and construction of the latter. I consider that the present knowledge we have of the construction of this great dome

* By Mr. R. Phené Spiers. See p. 316, *ante*.

just described should raise the Romans in your estimation as the greatest scientific architects the world has seen.

The vaults of the smaller halls and the semicircular domes being comparatively small in span, do not require any special description; the brick ribs are here employed also, in some cases forming intermediates, and stopping short one-third up the vault, as if their sole object were to keep the vault rigid, the spaces between being filled in with concrete, as before described.

It now remains to say a few words about the buttresses and abutments to resist the thrust, which in the case of the *tepidarium* and *calidarium* must have been very great. The abutments of the former measure 22 ft. 6 in. by 14 ft. and 96 ft. high; they are carried up straight above the roof or terminated with a cornice, on which may have been placed a group of figures. As a rule the Romans looked upon the buttress as a feature to be hidden or disguised. The former is done in the *calidarium* and the Pantheon, where the walls are of immense thickness. In both of these examples, as generally in all Roman works, niches, staircases, and passages are taken in the thickness of the wall, so as to reduce the amount of material employed, and to obtain additional space. Generally these niches and recesses were formed between the lines of thrust of the hidden ribs, though in the Pantheon, the distance of the ribs apart being small compared with the diameter of the building, they seem to have looked upon the vault as an homogeneous mass with a continuous thrust round the walls.

Whenever the Romans required a buttress they invariably disguised it by making it a column, and had they contented themselves with putting a corbel or bracket on the top, the expedient might have been satisfactory (except that, strictly speaking, a column is a constructive feature, intended to carry perpendicular weight and not slanting thrust). The column, however, in the Roman architect's mind was scarcely complete without its entablature, and therefore they added this, destroying in one sense the real object they had in view. There would be, however, three arguments in its favour: First, it might serve as pinnacles do to a Gothic buttress,—add to the vertical weight, always of importance in the resistance of a thrust. Secondly, if we look upon the semi or three-quarter detached column as simply the thickness of the wall at certain intervals, the expedient employed would be correct, and in this they would be copying the Greeks, who used detached columns with vases or statues on the top to strengthen and decorate long and lofty walls; and, thirdly, when the orders were not superimposed, the cornice would become the natural termination of the building. The Romans, however, did not always thus strictly reason, or they would not, as in the Coliseum, have placed superimposed orders, each with the entablature complete. In the *frigidarium* of the baths, you will notice, also, that the columns employed for the decoration, and perhaps strengthening, of the enclosing walls, have a slice of entablature of their own which is not carried across from column to column; and in the *tepidarium* the same feature is placed above the column, though here it serves a more definite purpose, because the base of the springer of the vault is larger than the frieze of the column. In Byzantine architecture they reduced the whole of the entablature thus shown to a spreading abacus, which gave them the broader base for their arches and vault springings, without employing features designed for a different purpose. There are many instances in Roman work, and we find it in two or three cases in these baths, of the advantages of bringing forward the springing of the vault well within the walls, — a scientific principle thoroughly worked out in Mediæval buildings. In the baths of Diana, at Nismes, already referred to, the vault is carried on a cornice and row of detached columns within the halls.

In conclusion, I cannot but feel that there are many points on which I have not been able to touch. The subject of Roman architecture alone is too vast to allow of my taking up more at a time than a small section, and I am glad to see that my friend Mr. Hilton Nash has acceded to my request to deliver a paper before you on the Coliseum at Rome. Owing to their magnificent construction, the remains of Roman architecture have stood so well the test of centuries of destruction by the hand of man and by weather that their number is legion, and it is far easier to restore in our imagination the precise forms and destination of every kind of Roman building after a lapse of from sixteen to eighteen centuries, than to reproduce the plans of our abbeys and monastic buildings, which six or eight centuries in many cases have quite swept away. What I more particularly have wished to impress on the mind of the student is this: that the study of architectural design is long and serious; that it is based upon definite principles which can only be acquired by a diligent examination of the works of bygone ages; that although it is always an advantage in such examination to compare them with the best modern works, no greater mistake can be made than to copy or attempt to copy the latter alone. Quaint mouldings, the egg-and-tongue ornament, dados round rooms, twisted and contorted gable-ends, do not constitute a style. The men who in the present day are the leaders of the so-called "Queen Anne" style were first brought up in the rigidity of the Classic orders; subsequently their student days were passed in the examination and admeasurement of the Mediæval buildings of Europe; and if, in discontent at the shortcomings of the Classic reproduction of the beginning of this century, or the Gothic revival of the last thirty years, they have turned to the debased forms of the Jacobean or Queen Anne periods, they have at least the knowledge of design which a sound architectural education has given them. If you wish to carry out the development they have commenced, or to surpass them in power of design, you must pass through the same course as they have. It is difficult to say where the tide of fashion may lead us; but I cannot but think that the superior art education which is now being received by all classes throughout the country will ultimately tend to the demand for a purer style of design, and if so, it is most important that you should in your studies prepare yourselves to meet the requirements in art which a more cultivated public will expect from those specially trained.

PREPARATIONS FOR THE NEW BOW-STREET POLICE-COURTS AND STATION.

THE new buildings which the Government are about to erect in Bow-street, immediately opposite Covent Garden Theatre, for the future Bow-street Police Station, and courts in connexion therewith, will shortly be commenced, the whole of the occupiers of the property which has been purchased for the purpose having now given up possession. The last of the properties surrendered was the Opera Hotel and Tavern, the effects of which were sold last week, and the work of demolition and clearing the site will be entered upon in a few days. The new buildings and premises in connexion with them will cover an area of nearly an acre in extent, and in addition to the Opera Hotel and several other business premises having their frontage to Bow-street, which have been purchased, upwards of twenty houses and shops in Broad-court, Duke's-court, and Cross-court, have been acquired, the outlay, it is stated, for the property and compensation being more than 100,000*l*. Included in the property purchased are the premises of Messrs. Howard, builders and contractors; the works and warehouses of Messrs. May, the well-known costumiers; together with the business establishments of several other leading manufacturers and dealers. All the houses on the south side of Broad-court, from Bow-street to Cross-street, have been taken, as well as several on the south side of Duke's-court, and all the houses on the west side of Cross-court. The Bow-street frontage of the new buildings will be upwards of 180 ft. in length, being about equal in length to those of Covent Garden Theatre and the Floral Hall, immediately opposite. The south side of Broad-court will form the northern boundary of the block, which will extend eastward from Bow-street to a depth of about 150 ft., the west side of Cross-court forming the rear boundary of the buildings.

Under one roof the new buildings will contain the courts for carrying on the magisterial business. These, we believe, will be about three in number, and so designed, both as to their capacity and general arrangements, as to meet the convenience of magistrates, professional gentlemen, and the public. In immediate connexion with them will be the magistrates' private rooms, magistrates clerks' rooms, witnesses' rooms, and other apartments. The police-station proper will likewise occupy a considerable portion of the area, containing the various offices, apartments for the superintendents, other superior officers, and private members of the force, together with prisoners' cells. Architecturally, we understand that the Bow-street elevation of the structure is to be of a rather ornamental character, so as to harmonise to some extent with the opera house opposite.

LIVERPOOL ENGINEERING SOCIETY.

AT a meeting of this Society, on the 28th ult., Mr. Hugh Blackburn, Stud. Inst.C.E., read a paper on "The Drainage of Towns." The author did not attempt to deal with the difficult problem of the disposal of sewage from inland towns, but confined himself to the question of the form and mode of constructing underground conduits or sewers. After pointing out the considerations affecting the capacity that a sewer should have, he next dealt with the form and rate of inclination that should be given so as to insure the sewers being as nearly as possible self-cleansing. It was then shown how branch sewers and house-drains should be connected one with the other, and with the main sewer. The proper ventilation of sewers, so as to prevent foul gases entering houses, was gone into in a clear and practical way, drains passing under houses being strongly condemned.

THE QUAKERS' "BUNHILL FIELDS" BURIAL GROUND.

MR. WILLIAM TALLACK, the secretary of the Howard Association, writes to one of the journals of the Society of Friends, of which he is a member, an interesting description of the disinterments, just completed, in an ancient City burial-ground of that religious denomination. In course of it he says,—The burial-ground consists of three main divisions. One of these is sold to the London School Board, with an understanding that the remains underneath are not to be disturbed. The second, which contains the dust of George Fox, Stephen Crisp, Alexander Parker, and other worthies, and also some of the most recent interments, will not be at all disturbed. It is only the third large portion (likely to be sold to an Industrial Dwellings' Company) which has been cleared of its remains, including those of Edward Burrough, Richard Hubberthorne, and some thousands of other Friends, chiefly, though not exclusively, of long past generations; also the remains of many persons, not Friends, buried there at the time of the plague. All that remains of the bodies of these honoured members of the Society has been carefully collected into large wooden boxes, and decently re-interred in the other portion of the grounds near George Fox's grave. (The precise position of the latter, long uncertain, has recently been ascertained from an old memorandum or measurement, and is accurately indicated for future visitors to the spot). The whole subject of the removals (rendered necessary by various circumstances) has been most carefully deliberated upon by the society, and carried out with the utmost respect to the memory of the dead, and at an expense of nearly 600*l*. In all Bunhill-fields 15,000 Friends (or upwards) are known to be interred; so that the remains now removed represent more than double the ordinary attendance of the great annual meeting of Friends in London. In very few instances amongst these thousands has anything like a perfect skeleton been found. In almost every instance the only remains consist, at most, of a few loose larger bones, as of the thigh and pelvis. Even the skulls are to a large extent decayed or gone to fragments. The coffins have, in general, quite disappeared, or are represented only by a brown admixture with the soil.

The Friends' "Bunhill-fields" is situated in Coleman-street, Bunhill-row, a hundred yards west of the larger public Bunhill-fields where John Bunyan and Dr. Watts are interred.

ARCHITECTS' AND CONTRACTORS' LIABILITIES.

SIR,—I wish to know what are the limits of the liability or responsibility of an architect and of a contractor for a work carried out by the latter, but after the designs and under the general superintendence of the former, and what objections, if any, might be made to a law running as follows:—

"If a building or any other considerable piece of masonry, undertaken by task-work shall, in the course of *fifteen years* from the day on which the construction of the same was completed, perish wholly or in part, or shall evidently be in danger of falling to ruin, owing to defects in the construction, or even owing to defects in the ground, the responsibility shall lie with the architect and the contractor."

Z.

SURVEYORSHIP ITEMS.

Bethnal-green.—The death is announced of Mr. William Mundy, surveyor of the parish of Bethnal-green. Although only forty-four years old, Mr. Mundy had gone through a large amount of hard work. He became surveyor to the Vestry in 1866, and previously held office under the Whitechapel Board of Works.

Londonderry.—According to the Dublin *Freeman's Journal*, the Londonderry county surveyor (Mr. Adair) is placed in a very awkward position. We read that "the proceedings at the late Londonderry Assizes opened by the reading of the county surveyor's report, in which that officer detailed a most unfortunate state of affairs existing in the county for a long time past. Besides having to work several existing contracts himself, no contractor could be got for eighty-three contracts. In fact, the state of the county is very bad indeed. Large prices have been approved at Sessions, and advertised, but contractors will not take the works; and the unconstitutional and wasteful system has to be resorted to of presenting these works to the very officer whose office was instituted to be a watch upon others, thus leaving no one to report upon him. When his report was read, a very respectable cesspayer addressed the Grand Jury, and on behalf of the cesspayers asked the Grand Jury to take the exceptional state of the county into consideration; but, will it be believed? the Grand Jury ignored the application, and the whole matter was hushed up, and nothing was done. Not a hand was stirred, nor a voice raised to stop the abuses complained of. The county surveyor also in this report, which displayed a most melancholy condition of affairs in his department, deplores his inability to get the existing vacancies among his assistants filled."

AMALGAMATED SOCIETY OF CARPENTERS AND JOINERS.

THE seventeenth annual report of the Amalgamated Society of Carpenters and Joiners has just been issued. From the introductory statement of the general secretary, Mr. J. D. Prior, it appears that, during a season of general commercial depression, the building trades have been actively employed; and although the society has paid during the year 18,219*l.* 16*s.* 10½*d.* in benefits to its members, it has added to the accumulated capital the sum of 14,809*l.* 13*s.* 2*d.* Thirty-one new branches have been opened during the year 1876,—twenty-five in England, three in Wales, one in Scotland, and two in Ireland. The number of members shows an increase of 1,121, making a total at the end of the year of 16,038. The income has amounted to 39,848*l.* 1*s.* 8*d.*, and the expenditure to 25,038*l.* 8*s.* 6*d.*, and at the end of the year there was a cash balance of 70,109*l.* 13*s.* 10*d.* An estimate of the value of the buildings and other property belonging to the society shows that the total amount of the assets is 74,762*l.* 15*s.* 11*d.*, or 4*l.* 13*s.* 2¾*d.* per member.

MASTERS AND MEN.

Kirkwall.—The joiners of Kirkwall have sent in an application for a rise of 1*d.* per hour in wages.

Perth.—The plasterers of Perth have resolved to memorialise their employers for an advance of 1*d.* per hour, to take effect on April 23rd. The present wage is 8*d.* per hour. The joiners have also appointed a deputation to wait upon their employers, to request that the wages be advanced ½*d.* per hour, the present rate being 7½*d.* per hour.

Glasgow.—On the 19th ult., the polishers in the marble works in Glasgow came out on strike on a question of hours. The polishers, who work fifty-seven hours per week, asked to be put on the same position as the cutters, whose hours are fifty-one per week. The masters refused to accede to the demand.

Aberdeen.—The operative masons held a meeting on the 22nd ult., at which various grievances were considered, but the only definite resolution come to was that the operatives take immediate steps for the purpose of having the system of sub-contracting abolished. There is some talk of a proposed advance of wages in this trade. The plumbers in the city are also agitating for a rise.

Edinburgh.—A meeting of the operative painters was held on the 22nd ult., in connexion with the agitation now going on in the trade for a rise of 1*d.* per hour on the present rate of wages. At the outset it was moved that, before proceeding to extremities, an offer should be made to the masters to submit the matter to arbitration, and this meeting with a pretty general support, a deputation of three was despatched to wait on the secretary of the Masters' Association, and lay this proposal before him. The deputation having returned, reported that the secretary of the Masters' Association could give no definite answer to the proposal of the men, but that he would convene the masters at once, and give their reply on an early date. It was carried on a division, by a large majority, that the men take no further action in regard to the proposed arbitration, and that in the event of no answer or an unfavourable answer being received, that, as originally agreed on, the notices be given in on the 31st ult. A subsequent meeting of the men to the number of over 500, was held on the 29th ult., in St. Mary-street Hall, to hear the answer of the employers to the demand for an addition of 1*d.* per hour to the present rate of wages, and the offer of arbitration on the subject. The employers having refused arbitration or conference, it was resolved to remit to the Investigation Committee,—consisting of one from Manchester, one from Glasgow, one from Leith, one from Edinburgh,—to consider the whole matter.

Bangor.—The men employed at the building yards at Bangor struck work on the 21st ult., owing to the masters refusing the Saturday half-holiday.

Liverpool.—Another dispute is stated to have arisen between the master-builders of Liverpool and the various classes of workmen, which, unless amicably arranged, may lead to another strike. Many of the large builders are also contractors, and that they form a body somewhat distinct from the class of builders (chiefly Welsh) employed in the erection of cottage property in and around Liverpool. These last-mentioned tradesmen have never as a body identified themselves with the Master-Builders' Association, because they thought their interests were not identical. They are now compelled, by force of circumstances, to take a stand against the demands which have been made upon them by the various classes of persons engaged in the building trade. A notice has been served upon the master-builders of Liverpool by the working joiners, demanding an increase in their wages from the early part of June, equivalent to about 4*s.* per week, and the Welsh builders have received from joiners, bricklayers, and plasterers a somewhat similar demand, to take place early in May. A most determined stand against this increase which is regarded as excessive has been made by all the masters; and apprehensions are entertained that unless some amicable arrangements can be effected there will be a general strike in the building trades in Liverpool, and many thousand persons will be thrown out of employment. The Welsh builders have resolved to form an association of their own, and in the most determined manner to resist the claims of the men. The master-builders of Liverpool have also taken steps in reference to the claims made upon them.—The operative plasterers of the town have intimated to the masters that on the 1st of May they will demand a reduction in the hours of labour and an increase of wages. Instead of ten hours, as at present, they request that the day's work should consist of nine hours, with the addition of 1*d.* per hour on the present pay. This will have the effect of reducing the labour time of the week by five hours and a half, with an increase of 5½*d.*

Portland.—The masons and carpenters of Portland have given notice to their employers that from the end of March they will require an advance of 6*d.* per day in their wages.

Arbroath.—The joiners of Arbroath held a meeting on the 27th ult., when they agreed to request an advance of pay from 6½*d.* to 7*d.* per hour. A short time ago the slaters got an advance of wages unasked, but they as a trade have been very busy for a long time past.

Dumfries.—The plasterers of Dumfries have received an advance of 1*d.* per hour. Their wages are now 9*d.* an hour, or 38*s.* 3*d.* a week.

Wigan.—Mr. Clarke Aspinall, of Liverpool, who was appointed arbitrator between the Wigan painters and their men as to the proposed reduction of ½*d.* per hour in wages, has made his award. He determines that the operatives shall continue to receive 8*d.* per hour, and recommends that his award shall continue in operation during the current year. The strike has lasted eight weeks.

Bolton.—The Bolton stonemasons having sought an advance of 11 per cent. on the present wages, the master-builders have met, and passed a resolution in which they said they deemed the proposal unreasonable, as the present state of the trade is worse than it has been for six or seven years. They allege that the action of the operative masons is causing trade to be much worse than it would be, and they have come to the determination not to accede to the demands.

Croydon.—In accordance with a resolution passed at a numerously-attended meeting of the house-painters of Croydon a few days since, all those men who are employed in shops, and are not in receipt of 7½*d.* per hour, have resolved to apply for an increase to that amount.

Ludlow.—The Dhue Stone sett squarers, who were on strike at the granite works in the Clee Hills, have nearly all left the district for northern and other counties, and the various companies have not replaced them by putting on fresh hands. The various works remain at a stand-still. The quarrymen and labourers are still upon strike. Local men are prepared to enter upon the stone "squaring," and express their confidence in being able to turn out the granite blocks in as masterly a manner as the "experts" who have gone away.

Stratford-on-Avon.—The bricklayers at Stratford-on-Avon, now receiving 33*s.* a week, demand an increase of ½*d.* an hour, which the masters refuse to concede. A strike is expected.

London.—A large meeting of master-builders has been held at the Westminster Palace Hotel, to consider the impending disputes in the building trade. The proceedings were private, but it transpired that there was a general determination to resist the demands of the men. Several resolutions were passed for the purpose of organising a committee and seeking support, and the meeting was adjourned till after Easter.

A TEMPTING OFFER.

A COPY of the *Newcastle Daily Chronicle* for the 19th ult. has been forwarded to us, with the view of directing our attention to the following barefaced invitation:—

TO ARCHITECTS.—The Heworth School Board invite Architects to send in PENCIL DRAWINGS, showing Front Elevation and Ground Floor of Infant School, to accommodate 120 children, intended to be built at Wardley. The Drawings must be sent to the Clerk of the Board not later than Thursday, the 5th of April, 1877. A plan of the ground may be seen, and the levels obtained, at the Wardley Colliery Office, Wardley. *No guarantee is given that any Architect will be employed in the building of the school.*—By order, George Bolam, Clerk to the Board.—25, Swinburne-street, Gateshead.

The italics do not appear in the original. It is to be hoped, for the credit of the architectural profession, and all connected therewith, that not a single design has been sent in in response to this very tempting offer.

CASE UNDER THE METROPOLITAN BUILDING ACT.

ON the 23rd ult. a builder was summoned to the Clerkenwell Police Court by Mr. Rowland Plumbe, district surveyor of South Islington, for not providing to a dwelling-house and shop, just rebuilt in the Essex-road, Islington, in the rear or on the side thereof, an open space, exclusively belonging thereto, of the extent at least of 100 square feet.

The builder asked for time to enable the owner to purchase ground to get the required space.

The magistrate, after hearing the facts, made an order requiring the builder to comply with the district surveyor's notice within twenty-one days.

THE RIGHT TO MAKE PUBLIC STREETS.

AIREY *v.* THE CORPORATION OF BOLTON.

THIS was a case tried at the Manchester Spring Assizes, before Mr. Justice Manisty.

Mrs. Elizabeth Bennett Airey, the plaintiff, is a widow, residing at Preston, and the owner of some cottage property in the borough of Bolton. The action was brought to recover damages from the defendants for trespass, and that the plaintiff might obtain an assertion of her rights in respect of certain acts done by the Corporation of Bolton on the plaintiff's property in that town. The plaintiff had ten cottages facing a street called Gregorfield, and at the back of this block there was a considerable slice of land also belonging to the plaintiff, which was said to have been planted as a garden and fenced in, and across which the Corporation made a street, and this was the trespass complained of. The defendants justified the act under the 69th section of the Public Health Act, 1848, which provided that if an owner of property failed to make a street to the satisfaction of the Local Board of Health,

the Board might execute it themselves and charge the owners with the cost. The usual notices were served upon the plaintiff to sewer, pave, flag, and channel the street called Back Gregson Field, but as the plaintiff did not comply with the notice, the Corporation, in her default, did the work, assuming that the land was a street. The whole question in dispute was whether the land was a street within the meaning of the Act.

His Lordship gave judgment for the plaintiff, with a verdict for 10 guineas. He said it seemed ludicrous to him to call the piece of land belonging to the plaintiff a "street" within the meaning of the statute; and how the corporation could have got such an idea into their minds he could not conceive. If Back Gregson's Field was in such a condition as to be a nuisance, the corporation had ample powers to deal with it; and if they wanted the land for the purposes of street improvement, then they must pay for it.

LIGHT AND AIR.

HARROW *v.* AGNEW.

THIS was an application, before Vice-Chancellor Sir Charles Hall, for an injunction to restrain Messrs. Agnew & Sons from continuing the buildings behind and to the west of New Bond-street, which they are now erecting for the purposes of their new picture gallery. The motion was made on behalf of Mr. Harrow, a portmanteau maker, who is the owner of premises in Albemarle-street, at the back of the proposed gallery, and who claimed that the light and air to the back windows of his house would be interfered with, and that the defendants might not be allowed to interfere with such light and air to any greater extent than was done by the buildings which previously stood on that ground.

The defendants made several offers to submit the question in dispute to arbitration, but Mr. Harrow declined to accept these offers, and held to his rights to have such light as he formerly had. Messrs. Agnew, on the other hand, expressed their determination to carry out their buildings according to their original plans, although their doing so might slightly diminish the plaintiff's light, and might leave an angle of less than 45 degrees between the roof of such buildings and the sill of the window of the room on the second floor, about which the chief complaint of diminution of light was made. Their contention was, that such diminution of light was really inappreciable, and that the Court would not grant the injunction asked for unless some substantial damage was shown. Evidence, as usual in these cases, of experienced and professional gentlemen was produced on both sides.

The Vice-Chancellor considered that the evidence which had been given was sufficient to prove, perhaps, that some injury to the plaintiff had already been done; and certainly that such an interference was contemplated as would entitle him to an injunction. He therefore granted an injunction to restrain the defendants, their contractors, and agents, from raising the walls of the proposed buildings to a greater height than they had been raised on the 3rd inst., so as to interfere with the access of light to the plaintiff's buildings to a greater extent than such access was interfered with by the buildings which stood upon the ground previously to the 1st of August last.

LABOUR AND CAPITAL.—A PAVIORS' STRIKE.

COLLINS *v.* GRIFFITHS.

THIS was an action beard in the Whitechapel County Court on the 1st ult., before Sir Walter Riddle.

The plaintiff was a labourer lately in the employ of the defendant, a stone merchant, of Kingsland-road, and sought to recover the sum of 1*l.* 10*s.* alleged to be due from his employer, being 1*l.* retained by the defendant during a period of two months, and 10*s.* in lieu of two days' notice. It appeared from the evidence that the plaintiff was discharged by defendant for drinking and fighting upon his work. Plaintiff said the 20*s.* was for 4*d.* per hour detained by defendant, but he admitted his full week's work would be only 56½ hours, and from wet and other causes, it was sometimes considerably less. The 10*s.* was for two days which he said he required as notice. It was said on the other side that the defendant had instituted a system of allowing men who were put upon the good conduct list a gratuity of 2*s.* 6*d.* per week, payable monthly, providing they were well conducted and properly attended to their work, which it was left to the discretion of the defendant to determine. This system had been in practice for some time past. Upon the commencement of this action the defendant immediately gave notice to the whole of the men so employed that he should discontinue the gratuity until the decision of the Court was given upon the summons.

Verdict was given for defendant with costs.

According to the *Hackney Express*, the defendant has not availed himself of the benefit of the above decision, but has since paid the gratuities to all the men to whom the promises given applied, amounting to a total sum of 30*l.* But the matter did not end there. The gratuities were paid on the following Tuesday, after which the men attended a meeting of their committee, and resolved that they would not continue their work at a less rate than 10*d.* per hour, or 7*s.* 6*d.* per day, and this for unskilled labour. Mr. Griffiths resented this demand, and on his refusal the whole of the paviors engaged on the paving of Pearson-street, Kingsland-road, struck work. The contractor laid the matter before the Paving Committee of the Shoreditch Vestry, and the committee unanimously agreed to extend the time for the completion of the works to any extent which might be found necessary.

METROPOLITAN IMPROVEMENTS.

SIR,—I have every reason to believe, and you may like to hear, that the Metropolitan Bill for new streets has been really altered; that the new line of route from Chandos to Coventry street is *vid* Green-street, Leicester-square, Spur-street, and the bottom of Princes-street. Mr. Edward Barry opposed, on the part of the National Gallery, the lopping off of their land.

The Duke of Bedford has commissioned Mr. H. Clutton to prepare designs for a new piazza for Covent-garden; and his Grace is busy himself over the scheme. I believe leases fall in at the close of this year. The suggested alteration in the direction of Bedfordbury has also been discussed, I hear. A TENANT.

KENSINGTON VESTRY-HALL COMPETITION.

AT the fortnightly meeting of the Kensington Vestry on Wednesday night last, Mr. Churchwarden Pearson in the chair, the question of receiving the designs from architects who had been invited to tender was considered. A report of the Law, Parliamentary, and Special Purposes Committee was read, from which it appeared they had received sixty designs. As they could not be conveniently exhibited in the Vestry-hall, the committee recommended that they should be placed in the old National Schools which had been purchased as a site for the new building. A discussion took place as to the appointment of a sub-committee to select three designs out of the number for the consideration of the Vestry.

Mr. Bridgwater moved that the plans be first hung up for general inspection.

Mr. Gibbons seconded the proposition, and said they could not be too careful to avoid a suspicion of jobbery. It seemed to him that the ratepayers ought to have an opportunity of judging.

Mr. Liggins replied that the Vestry had already appointed a committee to carry out that very thing.

Ultimately it was resolved to adopt the report, on the understanding that the joint committee would appoint the sub-committee. The Vestry also appointed three gentlemen to act with the Committee in the selection of the plans.

SIR,—I find some of the competitors for the proposed Vestry-hall at Kensington are sending reduced lithographed plans to the vestrymen of their designs. This I consider most unfair. As a competitor, I think the rules of the competition should be fairly kept, *and the race run as between the ropes, without any dodging about.* The merits of the building should be determined from such plans as were requested, and as submitted to the open vestry, not any privately distributed among and to the vestrymen.

G. GORDON STANHAM.

*** The practice is now so general that no competitor can be blamed if he think fit to follow it. Having thrown away a certain number of pounds in the wasteful gambling called A Competition, there is nothing to prevent him, under present arrangements, from throwing away a certain number of shillings in addition to strengthen his chance by bringing his proposition quietly under the eyes of his judges.

AMERICAN SLATES.

SIR,—Some time ago you gave some prominence to the fact of the arrival of roofing slates from America, and I hope you will allow me, through your columns, to give your readers the benefit of my experience, which is, that some at any rate of these slates are being sold as Welsh slates, to which they are very inferior, and only suited for jerry work. What I wish to do is to warn buyers of slates of this, and to advise their obtaining a guarantee that the slates they buy are of the quality specified.

A BITER BIT.

Books Received.

Half-Hours among English Antiquities. By LLEWELLYN JEWITT, F.S.A., &c. Illustrated with 300 engravings. Hardwicke & Bogue.

THIS small book devotes each separate chapter to giving the outlines of some separate branch of English archæology; of course, in a very general manner, but with sufficient information to start the reader in regard to the subjects treated of; to suggest to him the outlines of what is known, and some ideas as to what is to be known; and in what direction the further study of the subject should lead him. The first chapter, for example, is entitled "Among Barrows," and gives sections of typical forms of English barrows; the second is, "Stone Circles, Cromlechs, &c."; the third, "Among Implements of Flint and Stone," with numerous illustrations of arrow-heads and similar objects; then we have a chapter on bronze implements; one "Among Roman Roads, Towns, and Villas," and so on through various other subjects. The information is, of course, confined to generalities, but the author's name is a pretty good authority that it is correct as far as it goes; and even a general knowledge of the nature of these various species of relics of antiquity is of much use in an educational point of view, and is all that many people, even with the will to learn, can ever have time to acquire. Mr. Jewitt observes in his preface that he has endeavoured so to treat the various subjects as to popularise them, and to avoid being "dry" (the proverbial failing of antiquaries, in common opinion), and at the same time to make the volume something of a text-book or memorandum to those of more matured study. In avoiding the "dry" quality he has succeeded, and the numerous illustrations in themselves render the book valuable and interesting to both the classes of readers referred to.

VARIORUM.

Night and Day is the title of a monthly "Record of Christian Missions and Practical Philanthropy," edited by Dr. Barnardo, and which will at any rate serve to make wider known the various operations going on at the East-end under his guidance. If the publication exhibited a little less of what Mr. Gladstone, the other day, called, with happy bravery, "the slang" of religion, it would certainly please us better. No. 3 contains a view of the Lord Chancellor Ward, in the Infirmary for Children at Stepney Causeway. It is to be hoped that this ward has some arrangements for ventilation which are not obvious in the print. It is a long apartment, with a number of beds against a dead wall on each side, with windows in the end wall only. The aspect is alarming, as may be supposed.——It may be useful to mention that Mr. John Honeyman's paper on "Trade Unionism the Blight of British Industries and Commerce" has been published as a pamphlet by Hamilton, Adams, & Co., London.——The April Number of the *Popular Science Review* is a very good one. This periodical is now edited by Mr. W. S. Dallas, Assistant-Secretary of the Geological Society. In addition to articles which are of abiding interest, the *Popular Science Review* contains a complete record of progress in every department of science, including astronomy, botany, chemistry, ethnology, geography, geology, mechanics, metallurgy, microscopy, photography, physics, zoology, sciences applied to the arts, manufactures, and agriculture.——*Die Eisenbahn* (of the 23rd of March: Zurich) contains a plan and particulars of the new abattoirs constructed for the city of Geneva. Mr. Blanchot, of that city, was the engineer.——"Picturesque Europe" maintains well its character. Illustrating some of the old houses at Bristol, the writer says,—"Temple-street presents us with a specimen of civic domestic architecture, and is very little changed from the aspect which it wore when Queen Elizabeth saw it. The Flemish cloth-weavers, who were brought to England by Edward III., resided in this Temple-street, which still gives the impression of busy burgher life from day to day. 'Base mechanicals' would be the term applied by the conceited and empty-headed scoffers and swash-bucklers of Shakspeare's day to the Flemish weavers; but the handicraftsmen throve until the changes of time transferred the cloth manufacture from the West to the North of England. It is observable that, whenever sound and healthy national life produces good and picturesque architecture, the houses of all classes, of peasant as of peer, are beautiful. The castle and the mansion of the noble, the cottage of the peasant, the grange of the Franklin, the house of the burgher, were alike—while architecture was yet a living art,—convenient, suitable, and lovely. Honour to the great old poet builders! Let us now, remaining in the Capital of the West, stroll out with our artist by moonlight. Clouds are behind and around the waning moon, but her light shines, in the mystery of *chiaro-scuro*, upon a block of most quaintly decorated and singularly picturesque old gabled houses, on which we can gaze with delight, as we linger in the 'mirk o' night.' The building is St. Peter's Hospital. Seeing the olden pile in the gloom and mystery of night, we will pierce into no details we will be contented with the old houses as a picture and a charm."

Miscellanea.

Bill to Amend Metropolitan Building Act.—At the meeting of the Metropolitan Board of Works, on the 23rd ult., the Building Act Committee submitted the draft of a Bill to amend the Metropolis Management Act, 1855, the Metropolitan Building Act, 1855, and the Acts amending the same respectively, with respect to houses and buildings, and recommended that the Bill be approved by the Board. Mr. Selway explained that one of the objects of the Bill was to prevent the formation of roads for carriage traffic of less than 40 ft. A clause would be inserted that no house be erected in a road for carriage traffic at a less distance than 20 ft. from the centre, or 10 ft. if not intended for carriage traffic. Another point was to prevent houses from being constructed on rubbish. Some builders were in the habit of digging out gravel and filling up the foundations with rubbish of the most objectionable description, and then erecting the houses upon it. Bye-laws under the Bill would be framed under which houses could not be erected on foundations not approved by the district surveyor. Instances had occurred of houses falling down, it was supposed, from the use of improper materials. Clauses would be inserted in the Bill giving the Board power to regulate the use of materials. He asked the Board to approve the principle of the Bill, and that it be referred to the Works Committee to seek an interview with the Home Secretary to introduce the Bill as a public one. The motion was put and agreed to. The Bill, we are bound to add, has taken the architectural and building world by surprise.

Stone Dressing by Machinery.—We are glad to note that the stone-dressing machinery of Messrs. Allan Ransome & Co. (which we described at some length a few months since) is meeting with continued favour. A great advance has been made by Messrs. Brunton's machine, of which Messrs. Allan Ransome & Co. are the makers. It is the structure of the tool and its mode of action which constitute the peculiarity of this machine. In this lies the secret of the success with which it dresses the hardest granites and the most wearing grits. The machine consists of a bed-plate with standards carrying the dressing apparatus. The stone to be dressed is fixed to a travelling table, which is mechanically moved backwards and forwards under a set of revolving cutters. These latter consist of three circular discs of steel projecting from the under side of a chuck in which they are carried. Each cutter has a rotary motion of its own, and the chuck also revolves with them. The cutters revolve very rapidly over the face of the stone, and clear off the rough surface with astonishing rapidity, the wear and tear of the cutters being remarkably small. It is capable of dressing blocks of Aberdeen granite at the rate of 1½ ft. super. per minute. Ordinary limestones are of course dressed at a much more rapid rate. Several of these machines, specially suited for granite, are being made by Messrs. Ransome for use in the Aberdeen district.

Bedfordbury: The Plague-Spot of St. Martin's.—Mr. D. Cubitt Nicholls sat as Commissioner at the Vestry-hall, St. Martin's-in-the-Fields, on the 17th ult., to hear and consider the report of the medical officer of health for the district of St. Martin's as to the demolition of property in Bedfordbury and the adjacent courts and alleys, and to receive the objections of the holders as to its destruction. Mr. Grantham, Q.C., cited the report of the medical officer of health, who described Bedfordbury as the plague-spot of St. Martin's. Mr. Skegg, the medical officer, gave evidence as to the general insanitary nature of the district. Sir Joseph Bazalgette said that the Board by their present scheme contemplated demolishing houses covering an area of an acre. On this ground in fifty-seven houses lived nearly 800 people, giving an average of 2·19 per room, many of the rooms being so small that the bed occupied half the space. The whole family here lived, ate, slept, and worked.

Value of Land.—A plot of freehold building land (part of the site of the late church of St. Michael, Queenhithe), having frontages to Upper Thames-street and Little Trinity-lane, and containing an area of about 2,690 square feet, was offered for sale by tender by Messrs. Fuller, Horsey, Son, & Co., on the 22nd ult., and has since been sold for the sum of 10,770*l.*, being at the rate of a fraction over 4*l.* per square foot.

The Liverpool Water Supply and the Borough Engineer.—The special committee appointed by the Liverpool Town Council to inquire into the charges made by Mr. Alderman Bennett against Mr. Deacon, the borough engineer, held their final meeting on the 28th ult., and approved of a report which was to be presented to the Council on Wednesday last. The alderman charged Mr. Deacon with copying the plans and specifications of Messrs. Mather & Platt for the boring-work at Bootle. We append the conclusions at which the committee have arrived:—

1. That there is a similarity in the general designs of Messrs. Mather & Platt and the water engineer, as far as the principle of raising from a deep borehole is concerned; but there are differences in details which sufficiently prove that the water engineer did not avail himself of Messrs. Mather & Platt's specification or plans.
2. That the similarity before mentioned was inevitable, having regard to the directions to which the water engineer was required to work by the committee.
3. That the evidence before the committee does not bear out Messrs. Mather & Platt's contention that certain details in their plans and specifications which they complain of the engineer having adopted, were exclusively used by them, and were not used by other engineers for similar purposes.
4. That the committee are of opinion that the water engineer is exonerated from any charge of piracy or improperly using the plans and specifications of Messrs. Mather & Platt.

The Walker Art Gallery, Liverpool.—The statuary which is being executed in Rome by Mr. Warrington Wood for the Walker Art Gallery has been finished. The Library Committee will now make arrangements for the speedy opening of the Art Gallery; but it is impossible as yet to fix a date for the ceremony, as that depends a good deal on the success of the negotiations to get a member of the Royal family to open the building. It is intended to ask the Prince of Wales to open the gallery, and very confident hopes are entertained that his Royal Highness will accede to the request. There was some expectation that her Majesty would visit Manchester during the summer for the purpose of opening the new Town-hall there, and that the royal visit might be extended to Liverpool; but the Queen will not go to Lancashire.

Dr. Schliemann has arranged to attend a meeting of the British Archæological Association on Wednesday evening, the 11th inst., to receive the diploma of membership; for which purpose the Council of the Institute of Architects have granted the use of their rooms in Conduit-street. Lord Houghton will preside, and several gentlemen will speak on the occasion. It is understood that Dr. Schliemann will read a paper "On Troy and its Analogy to Mycenæ." The Council of the British Archæological Association, with very proper consideration, have delayed their meeting in order that it might not in any way interfere with the reception of the Dr. by the Society of Antiquaries.

Royal Horticultural Society.—The fortnightly show of the Royal Horticultural Society, held on Wednesday last, in the Conservatory under the Albert Hall, was a very choice exhibition. At the meeting held before the show eighty-five of the new order of members, who pay one guinea annually, were elected, in addition to twenty-five new Fellows, so that a rift seems opening in the black financial prospects of the Society. The flower-show was attended by a very large number of visitors, in spite of the pouring rain, which, though it did not penetrate the warm and pleasant conservatory, came into some of the corridors, and bestowed on the evergreens with which they were decorated more than their daily allowance of water.

Cleeve Abbey—Another interesting discovery is reported to have been made at Cleeve Abbey. Some time ago it was ascertained that on the south side of the present refectory there were old foundations of what was supposed to have been a former refectory. On the 27th ult. some men were put to work to remove the earth between these foundations, and at a depth of a little over 2 ft., a tesselated pavement was found. It is 40 ft. long and 14 ft. broad. The tiles are of heraldic design, seven or eight various kinds, and some are as large as 8 in. square. The pavement is nearly perfect.

German Artisans and the Paris Exhibition.—A telegram from Berlin says that a petition has been presented to the Reichstag by the artisans employed in the manufacture of objects of art and in art industry, praying for reconsideration of the French invitation to the Paris Exhibition, and in a sense favourable to German participation.

Manchester Royal Infirmary.—The committee appointed by the Board on the 19th of February to prepare a code of instructions to architects with a view of obtaining professional opinions as to the best means of remedying the constructive defects of the Infirmary, and providing for its enlargement, brought up their amended report. The committee recommended that Messrs. Mills & Murgatroyd, Messrs. Pennington & Bridgen, and Mr. Thomas Worthington should be requested to undertake the work, and that a fee of 100 guineas should be paid to each of these firms. This was ultimately agreed on by the Board.

City Guilds Industrial University.—In carrying out this scheme, it is proposed to erect a building as the central hall of the University, on a plot of ground between the Temple and Blackfriars, on the Thames Embankment, consisting of a large amphitheatre or lecture-room, a council-room, with library, a museum of trade examples, and a room for models. It is held that to begin the movement on a scale commensurate with the necessities of the times, and the wealth and intelligence of the associated livery companies, not less than 10,000*l.* per annum should be guaranteed over and above the provision for a building fund.

Health and Sewage of Towns.—The Sewage Conference of the Society of Arts is fixed to be held on the 3rd and 4th of May next, under the presidency of the Right Hon. James Stansfeld, M.P., late president of the Local Government Board, and a large gathering of representatives from the principal cities and towns of the United Kingdom is expected to attend. Papers on proved results of systems adopted in various localities are already promised for reading and discussion, and an exhibition of sanitary appliances will be got together for inspection.

Bristol and Gloucestershire Archæological Society.—A general meeting will be held in Cheltenham on the 19th inst. Amongst the business to be done the following papers will be read:—"Dr. Hübner, on the Discovery of the Walls of Gloucester, and Remarks on the Military Occupation of the City in the Roman Period," by Mr. John Bellows; "The Parish Church of Cheltenham," by Mr. Daniel J. Humphris; and "The Roman Camp at Haresfield, near Gloucester," by J. D. T. Niblett.

Billingsgate.—Messrs. Chas. S. Kelsey & Son have just completed the sculpture of the central portion of the new fish market, Billingsgate, for Mr. Horace Jones, the City architect. The works consist of a statue of Britannia, 10 ft. high, on the apex of pediment; two groups of entwined dolphins, and the tympanum, 30 ft. by 6 ft., filled in with the City arms in high relief. The whole is very bold and effective.

Royal Society.—The number of candidates for the F.R.S. this year is fifty-seven (nearly four times as many as can be elected), each of whom, nevertheless, is able to give a very fair account of himself.

Tall Students.—A Wisconsin paper says, "Its Board of Education has resolved to erect a building large enough to accommodate 500 students three stories high."

Honours to an Antiquary.—The *Oxford University Herald* states that the honorary degree of Master of Arts has been conferred upon Mr. James Parker, son of Mr. J. H. Parker, C.B.

The Mosaic Code of Sanitation.—An interesting lecture on this subject has been delivered before the Jewish Working Men's Club and Institute, by Mr. Ernest Hart.

TENDERS

For building a house at Forest-gate for Mrs. Greig. Mr. J. Wesley, architect:—

Curtis	£1,161	0	0
Johnson	1,038	0	0
Salt	1,016	0	0
Palmer	995	0	0
North	985	0	0
Judd & Hawkings	914	0	0
Tillett	895	0	0

For alterations to the Eastern Hall and Tavern and two shops adjoining, East India-road, for Mr. J. G. Paterson. Mr. J. Harris, architect:—

Sheffield	£3,993	0	0
Wood	3,629	0	0
Palmer	3,589	0	0
Perry	3,575	0	0
Bangs & Co.	3,483	0	0
Forrest	3,439	0	0
Morter	3,395	0	0
Johnson	3,227	0	0
Hearle & Son	3,185	0	0
Judd & Hawkings	2,849	0	0

For the erection of schools, covered playgrounds, and caretaker's house, to accommodate 750 children, for the Heworth School Board, Durham. Mr. Thomas Oliver, architect:—

Greason & Stockdale	£6,884 6 0
Mitcheson	6,450 0 0
Rennison & Simpson	6,250 0 0
N. & R. Reed	6,180 0 0
Oake	6,075 0 0
Elliott	5,999 0 0
Middlemiss, Bros.	5,986 17 9
White & Sproat	5,970 0 0
Wilkinson & Son	5,800 0 0

For building two shops and three shops at Norwood. Messrs. Power & Wheeler, architects. Quantities by Mr. Barnett:—

	Two Shops.	Three Shops.
Bowyer & Co.	£2,300	£3,400
Merritt & Ashby	2,310	2,830
Shaw	2,223	2,804
Jenkins	2,078	2,640
Brass	2,277	2,613
Sewell	2,187	2,590
Newman & Mann	2,175	2,562
Dove, Brothers	2,115	2,596
Smale	2,160	2,536
Allen & Co.	2,120	2,535
Bracher	2,078	2,490
Thomas	1,950	2,450
Aitchison & Walker	1,985	2,396
Ward & Son	1,600	2,100

For the erection of bakery buildings, stables, &c., in Monk-street, Derby, for the Derby Co-operative Provident Society (Limited):—

Bridgart (accepted)	£3,092 0 0

For alterations for Mr. Emery, linendraper, Commercial-road East, London. Mr. Cotton, architect. No quantities:—

Somes	£1,093 0 0
Abraham	1,047 0 0
Wood	1,025 0 0
Hearle	985 0 0
Johnson	797 0 0
Johnstone	756 0 0
Palmer	749 0 0

For two cottages to be erected in the Canterbury-road, Folkestone, for Mr. Sharp. Mr. Burgess J. Reeve, architect:—

	16-ft. 10 in. Frontage.	15-ft. Frontage.
Webster	£490	£470
Butler	475	430
Hall	380	370
Reason	353	340
Payne	—	300

For repairing and decorative work to house for Mr. Joseph Welch, Banstead, Surrey. Mr. R. M. Shaw, architect:—

Pitman & Cuthbertson	£799 0 0
Simpson & Son (accepted)	738 0 0

For the erection of schools, &c., at Clowne, Derbyshire, for the Clowne School Board. Messrs. Rollinson & Son, architects:—

Marriott	£3,150 0 0
Hodson & Facon	2,665 0 0
Fidler	2,630 0 0
Fidler, Bros.	2,600 0 0
T. Tutin	2,559 0 0
Barber	2,553 0 0
Broomhead	2,550 0 0
S. Tutin	2,270 0 0
Lister	2,253 0 0
Hibbard (accepted)	2,106 0 0

For the erection of schools, teacher's residence, fence walls, and conveniences, together with road formation, at South Normanton, Derbyshire, for the South Normanton U.D. School Board. Messrs. Rollinson & Son, architects:—

Hays	£3,293 0 0
Broomhead	3,116 0 0
Andrews	3,098 0 0
Tutin	3,076 0 0
Hudson & Facon	3,052 0 0
Page & Bird	2,996 0 0
Winn	2,872 0 0
Greenwood	2,774 0 0
Weston (accepted)	2,738 0 0
Green	2,662 0 0
Roe	2,557 0 0
Monks & Richer	2,394 0 0

For alterations to the "Widow's Son," Bromley. Mr. J. Harris, architect:—

Judd & Hawkings	£783 0 0
Forrest	699 0 0
Cole	675 0 0
Walker	631 16 0

For a pair of semi-detached cottages at Snaith, Yorkshire, for Mr. Hugh Jennings. Mr. William Watson, architect:—

Hinsley	£700 0 0
Bland	695 0 0
Fairbairn	600 0 0
Widdop (accepted)	565 0 0

For schools at Eastmoor, for 650 children, for the Wakefield School Board. Mr. William Watson, architect:—

Ives & Sons	£5,712 0 0
Young	4,996 0 0
Gibson	4,798 0 0
Webster (accepted)	3,841 15 0

For enlarging the business premises of Messrs. E. Peniston & Co., Doncaster. Mr. William Watson, architect:—

Athron	£3,600 0 0
Anelay	3,307 0 0
Johnson	3,223 0 0
Arnold*	3,205 0 0

* Accepted, subject to amendment.

Accepted for a pair of semi-detached residences on the St. John's Estate, Wakefield, for Mr. Wm. Wadsworth. Mr. William Watson, architect:—

Brick and Stone.

Fawcett	£959 19 6

Slating.

Pycock & Son	69 0 0

Plastering.

Eastwood	105 10 0

Woodwork.

Gibson	462 0 0

Plumbing, Glazing, and Ironwork.

Nelson	159 15 0

Painting.

Naylor	27 0 0

For alterations at No. 11, Lowndes-terrace, for Messrs. Harvey, Nicholls, & Co. Mr. Alfred Williams, architect:—

Thorne	£1,730 0 0
Sprake	1,497 0 0
Grimwood & Sons	1,441 0 0
Banstead & Sons	1,430 0 0
Stimpson & Co.	1,380 0 0

For the erection of a new cast-iron tank and foundation walls at the Braintree Waterworks, for the Local Board. Mr. Geo. Seamell, engineer:

Cast-iron Tank.

Bells & Lightfoot (accepted)	£565 0 0

Foundation Walls.

Letch (accepted)	237 10 0

For two warehouses, Little Britain. Messrs. N. S. Joseph & Pearson and Mr. G. E. Alce, joint architects. Mr. T. Thornton Green, surveyor:—

Merritt & Ashby	£6,430 0 0
Browne & Robinson	6,300 0 0
Thompson	6,270 0 0
Rider & Son	6,138 0 0
Brass	5,846 0 0
Bangs & Co.	5,747 0 0
Nightingale	5,650 0 0
Bayes, Bros., & Allen	5,600 0 0
Scrivener & White	5,579 0 0
Newman & Mann	5,500 0 0
Langmead & Way	5,295 0 0
Sabey & Son	5,093 0 0

TO CORRESPONDENTS.

C. K. & Son.—S.—L. H.—G. G. S.—E. G.—J. F. M.—J. W. S.—J. J. A.—W. H. T.—C. E. L. G.—M.—E. P.—M. R.—C. I.—J. H.—C. C.—H. H.—J. H. J.—L. R.—J. R. & Son.—P. & R.—A. T. H.—B. & R.—P. & C.—Dowager Lady R.—R. B.—M. & T.—J. R.—W. H. B.

We are compelled to decline pointing out books and giving addresses.

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